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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

FOREST CONDITIONS

IN THE

CASCADE RANGE FOREST RESERVE

OREGON

BY

H. D. LANGILLE, FRED G. PLUMMER, ARTHUR DODWELL, THEODORE F. RIXON
AND JOHN B. LEIBERG

WITH AN INTRODUCTION

BY

HENRY GANNETT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1903

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., June 17, 1902.

SIR: I beg to transmit herewith, for publication as a professional paper, reports upon the Cascade Range Forest Reserve, by Messrs. H. D. Langille, Fred G. Plummer, Arthur Dodwell, and Theodore F. Rixon, with an introduction by myself. I have added to these reports matter from Mr. J. B. Leiberg's paper in the Twenty-first Annual Report, relating to the southern end of the reserve, in order to complete the description of the reserve.

Very respectfully, yours,

HENRY GANNETT,
Geographer.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

FOREST CONDITIONS IN THE CASCADE RANGE FOREST RESERVE, OREGON.

INTRODUCTION.

By HENRY GANNETT.

BOUNDARIES.

The Cascade Range Forest Reserve of Oregon was created by proclamation of President Cleveland, dated September 28, 1893. The following are the boundaries as originally constituted:[a]

"Beginning at the meander corner at the intersection of the range line between ranges six (6) and seven (7) east, township two (2) north, Willamette meridian, Oregon, with the mean high-water mark on the south bank of the Columbia River in said State; thence northeasterly along said mean high-water mark to its intersection with the township line between townships two (2) and three (3) north; thence easterly along said township line to the northeast corner of township two (2) north, range eight (8) east; thence southerly along the range line between ranges eight (8) and nine (9) east to the southwest corner of township two (2) north, range nine (9) east; thence westerly along the township line between townships one (1) and two (2) north to the northwest corner of township one (1) north, range nine (9) east; thence southerly along the range line between ranges eight (8) and nine (9) east to the southwest corner of township one (1) north, range nine (9) east; thence easterly along the base line to the northeast corner of township one (1) south, range ten (10) east; thence southerly along the range line between ranges ten (10) and eleven (11) east to the southeast corner of township four (4) south, range ten (10) east; thence westerly along the township line between townships four (4) and five (5) south to the southwest corner of township four (4) south, range nine (9) east; thence southerly along the west boundary of township five (5) south, range nine (9) east to its intersection with the west boundary of the Warm Springs Indian Reservation; thence southwesterly along said Indian reservation boundary to the southwest corner of said reservation; thence southeasterly along the south boundary of said Indian reservation to a point on the north line of section three (3), township twelve (12) south, range

[a] Stat. L., vol. 28, p. 1240.

nine (9) east, where said boundary crosses the township line between townships eleven (11) and twelve (12) south, range nine (9) east; thence easterly to the northeast corner of township twelve (12) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east to the southeast corner of township thirteen (13) south, range nine (9) east; thence westerly along the third (3rd) standard parallel south to the northeast corner of township fourteen (14) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east to the southeast corner of township fifteen (15) south, range nine (9) east; thence easterly along the third (3rd) standard parallel south to the northeast corner of township sixteen (16) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east to the southeast corner of township twenty (20) south, range nine (9) east; thence easterly along the fourth (4th) standard parallel south to the northeast corner of township twenty-one (21) south, range nine (9) east; thence southerly along the range line between ranges nine (9) and ten (10) east to the southeast corner of township twenty-three (23) south, range nine (9) east; thence westerly along the township line between townships twenty-three (23) and twenty-four (24) south to the southeast corner of township twenty-three (23) south, range six (6) east; thence southerly along the range line between ranges six (6) and seven (7) east to the southwest corner of township twenty-five (25) south, range seven (7) east; thence westerly along the fifth (5th) standard parallel south to the point for the northwest corner of township twenty-six (26) south, range seven (7) east; thence southerly along the surveyed and unsurveyed west boundaries of townships twenty-six (26), twenty-seven (27), twenty-eight (28), twenty-nine (29), and thirty (30) south to the southwest corner of township thirty (30) south, range seven (7) east; thence westerly along the unsurveyed sixth (6th) standard parallel south to the point for the northwest corner of township thirty-one (31) south, range seven and one-half (7½) east; thence southerly along the surveyed and unsurveyed west boundaries of townships thirty-one (31), thirty-two (32), and thirty-three (33) south, range seven and one-half (7½) east to the southwest corner of township thirty-three (33) south, range seven and one-half (7½) east; thence easterly along the township line between townships thirty-three (33) and thirty-four (34) south to the northeast corner of township thirty-four (34) south, range six (6) east; thence southerly along the east boundaries of townships thirty-four (34) and thirty-five (35) south, range six (6) east, to the point of intersection of the east boundary of township thirty-five (35) south, range six (6) east, with the west shore of Upper Klamath Lake; thence along said shore of said lake to its intersection with the range line between ranges six (6) and seven (7) east, in township thirty-six (36) south; thence southerly along the range line between ranges six (6) and seven (7) east to the southeast corner of township thirty-seven (37) south, range six (6) east; thence westerly along the township line between townships thirty-seven (37) and thirty-eight (38) south to the southwest corner of township thirty-seven (37) south, range four (4) east; thence northerly along the range line between ranges three (3) and four (4) east to the northwest corner of township thirty-six (36) south, range four (4) east; thence easterly along the eighth (8th) standard parallel south to the southwest corner of township thirty-five (35) south, range four (4) east; thence northerly along the range line between ranges three (3) and four (4) east to the southwest corner of township thirty-one (31) south, range four (4)

east; thence westerly along the township line between townships thirty-one (31) and thirty-two (32) south to the southwest corner of township thirty-one (31) south, range one (1) east; thence northerly along the surveyed and unsurveyed Willamette meridian to the northwest corner of township twenty (20) south, range one (1) east; thence easterly along the township line between townships nineteen (19) and twenty (20) south to the northeast corner of township twenty (20) south, range one (1) east; thence northerly along the range line between ranges one (1) and two (2) east to the northwest corner of township eighteen (18) south, range two (2) east; thence easterly along the township line between townships seventeen (17) and eighteen (18) south to the southeast corner of township seventeen (17) south, range two (2) east; thence northerly along the range line between ranges two (2) and three (3) east to the southwest corner of township seventeen (17) south, range three (3) east; thence easterly along the surveyed and unsurveyed township line between townships seventeen (17) and eighteen (18) south to the point for the southeast corner of township seventeen (17) south, range four (4) east; thence northerly along the surveyed and unsurveyed range line between ranges four (4) and five (5) east, subject to the proper easterly or westerly offsets on the third (3rd), second (2nd) and first (1st) standard parallels south, to the northwest corner of township five (5) south, range five (5) east; thence easterly along the township line between townships four (4) and five (5) south to the southeast corner of township four (4) south, range six (6) east; thence northerly along the range line between ranges six (6) and seven (7) east to the northwest corner of township four (4) south, range seven (7) east; thence easterly along the township line between townships three (3) and four (4) south to the southwest corner of section thirty-four (34), township three (3) south, range seven (7) east; thence northerly along the surveyed and unsurveyed section line between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22), fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and four (4), to the northwest corner of section three (3) of said township and range; thence easterly along the surveyed and unsurveyed township line between townships two (2) and three (3) south to the point for the southeast corner of township two (2) south, range eight (8) east; thence northerly along the unsurveyed range line between ranges eight (8) and nine (9) east to the southeast corner of township one (1) south, range eight (8) east; thence westerly along the township line between townships one (1) and two (2) south to the southeast corner of section thirty-four (34), township one (1) south, range eight (8) east; thence northerly along the section line between sections thirty-four (34) and thirty-five (35), twenty-six (26) and twenty-seven (27), and twenty-two (22) and twenty-three (23) to the northeast corner of section twenty-two (22); thence westerly along the section line between sections fifteen (15) and twenty-two (22) to the southeast corner of section sixteen (16); thence northerly on the section line between sections fifteen (15) and sixteen (16) to the point for the northeast corner of section sixteen (16); thence westerly along the section line between sections nine (9) and sixteen (16) to the southeast corner of section eight (8); thence northerly along the section line between sections eight (8) and nine (9) and four (4) and five (5) to the northwest corner of section four (4), township one (1) south, range eight (8) east; thence easterly along the base line to the southeast corner of section thirty-three (33), township

one (1) north, range eight (8) east; thence along the unsurveyed section lines northerly to the point for the northeast corner of section thirty-three (33), westerly to the point for the northeast corner of section (32), northerly to the point for the northeast corner of section eight (8), westerly to the point for the southwest corner of section six (6); thence northerly along the unsurveyed range line between ranges seven (7) and eight (8) east, to the point for the northwest corner of township one (1) north, range eight (8) east; thence westerly along the unsurveyed township line between townships one (1) and two (2) north to the northwest corner of township one (1) north, range seven (7) east; thence northerly along the surveyed and unsurveyed range line between ranges six (6) and seven (7) east to the meander corner at its intersection with the mean high-water mark on the south bank of the Columbia River, the place of beginning."

Subsequently the west half of T. 1 S., R. 10 E., was released from the reserve.

By proclamation of President McKinley certain additions were made to this reserve, as follows:

"The south half (S. ½) of township one (1) south, townships two (2) south, three (3) south, and four (4) south, range eleven (11) east, Willamette meridian; townships five (5) south, ranges nine (9) and ten (10) east, and so much of township six (6) south, ranges nine (9) and ten (10) east as lies north of the Warm Springs Indian Reservation."

EXAMINATIONS.

The area of the reserve, including the recent additions, is 4,883,588 acres, or 7,254 square miles. It is the largest of all the reserves, extending from Columbia River, on the north, southward nearly to the California boundary, thus extending nearly across the State.

In 1899 the southern part of the reserve, including the area south of the forty-third parallel of latitude, comprising about 1,000 square miles, was examined by Mr. Leiberg as a part of a much larger area examined in southern Oregon. His report upon that area was published in the Twenty-first Annual Report, Part V. The remainder of the reserve, comprising over 6,000 square miles, was examined during the past season. For this purpose this area was divided into three parts. That part lying north of the north line of township 5 south was assigned to Mr. H. D. Langille. It was the original intention in assigning to Mr. Langille so small an area that he examine also the area of the Bull Run Reserve, which is the source of water supply of the city of Portland and which adjoins the north end of the Cascade Range Reserve on the west; but this course was objected to so strenuously by the water board of the city of Portland, who saw in the publication of the results of this examination a possible source of danger to their water supply, that the examination of the Bull Run Reserve was not undertaken. Besides examining the northern part of the Cascade Range Forest Reserve, Mr. Langille examined townships 1, 2, and 3 north, 9 and 10 east, lying outside of the reserve and in the northeastern reentrant angle.

A. MOUNT HOOD, FROM THE SOUTH.

B. MOUNT HOOD, FROM CLOUD CAP INN.

To Mr. Fred G. Plummer, with an assistant, was assigned the examination of that portion of the reserve lying between the north line of township 5 and the south line of township 17, together with that portion of the Warm Springs Indian Reservation which lies west of the east line of range 11.

To Messrs. Arthur Dodwell and Theodore F. Rixon was assigned the southern section lying between the south line of township 17 and the somewhat irregular northern line of Mr. Lieberg's examination, which may be set at about latitude 43.

The examination of these areas was completed and reported upon. The report of Mr. Langille is herewith presented as written. That of Mr. Plummer has been supplemented by more detailed township descriptions, while that of Messrs. Dodwell and Rixon has been prepared in this office from the full and excellent data and notes secured by these gentlemen. Photographs illustrating fully the forest conditions and topography of this remarkable volcanic region were secured, and a selection from them has been used for illustrating the reports. A reconnaissance topographic map in sufficient detail to present upon a scale of 4 miles to an inch, with the relief represented by contours at intervals of 250 feet, was made. This is the first map ever prepared of this region upon any considerable scale, with the exception of such parts of it as have been subdivided by the General Land Office. The methods employed in preparing this map are those commonly used in reconnaissance work. Lines in the land surveys were utilized as base lines, and triangulation extended therefrom, locating by intersections all summits, junctions of streams, and other natural points susceptible of such location, sketching the relief and drainage between and with reference to located points.

The portion about Mount Hood, which was surveyed by Mr. Langille, was done with greater accuracy and in greater detail, using the plane table, and the map is published upon a scale of 2 miles to an inch with the same contour interval.

TOPOGRAPHY AND GEOLOGY.

This forest reserve is comprised in the Cascade Range, most of which, within the limits of Oregon, is included in the reserve.

The Cascade Range in Oregon, whatever its nucleus may be, is composed, so far as can be discovered, of volcanic material, lava, ashes, and cinder. The range, which is remarkably straight, runs in a nearly north-south line from Columbia River southward to the south boundary of Oregon, with an average altitude of perhaps 6,000 feet, though differing in elevation widely in different parts. Upon or near its crest line stand enormous extinct volcanoes from Hood on the north to Pitt on the south. The principal ones are, enumerating them in order from north to south: Hood, Olallie Butte, Jefferson, Three-fingered Jack, Washington, Belknap and Black Craters, Three Sisters, Bachelor Butte, Packsaddle Mountain, Maiden Peak,

Diamond Peak, Mounts Thielsen, Bailey, Mazama, Scott, Union Peak, and Mount Pitt, besides many craters and other centers of volcanic disturbance. Upon this broad summit are many lakes and marshes formed by recent lava flows which have filled the drainage channels. In some cases these channels have been merely obstructed in such wise that the flow is retarded only, so that in the spring lakes of considerable size are formed by the melting of snows, which later in the season are drained in whole or in part.

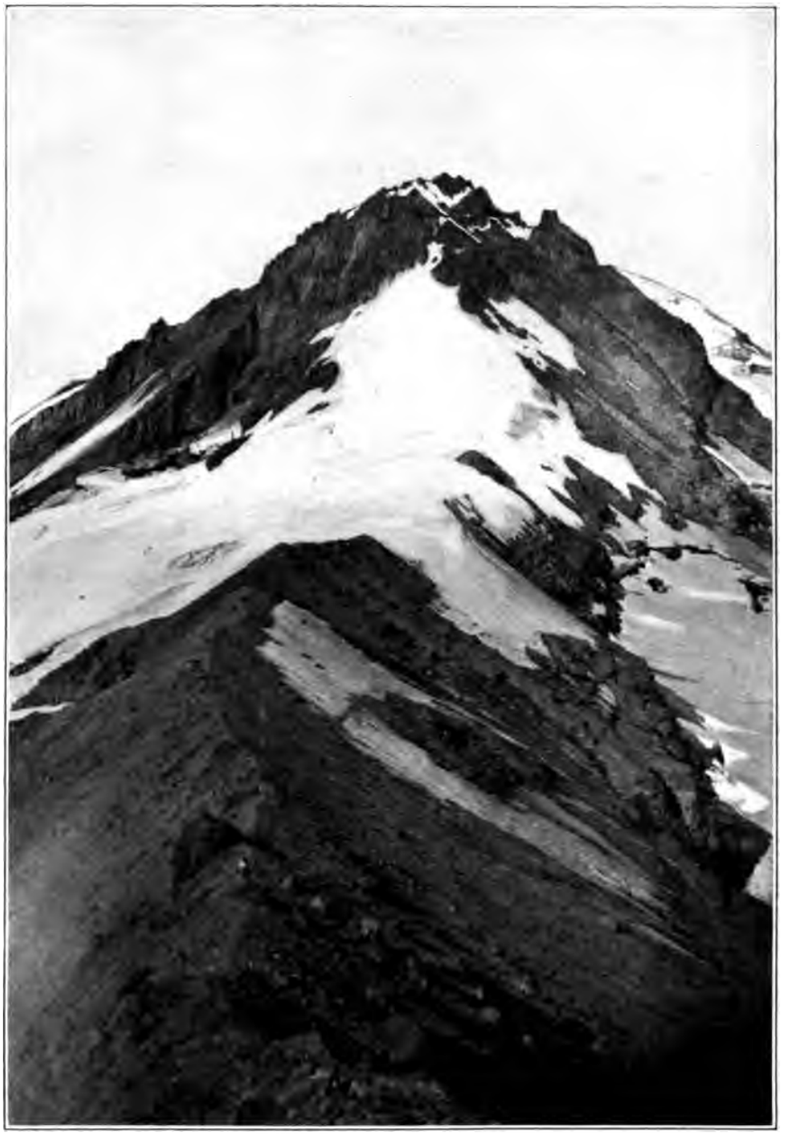
From the summit the range descends to the east by long gentle slopes and broad flat spurs to a plateau having an average elevation of 4,000 feet in the middle and southern latitudes, diminishing northward to near sea level at the Columbia. The main body of the mountainous country lies west of the summit of the range, and consists of heavy mountain spurs separated by deep canyons. The average breadth of the range is not far from 75 miles. The range is drained on the north direct to the Columbia by Hood River, on the east by the Deschutes and its branches and Klamath River, and on the west by the Willamette, Rogue, and Umpqua.

The Columbia cuts a gorge across the Cascade Range, cleaving it from summit to sea level. The mountains rise steeply from the river, reaching, within a mile, altitudes of 3,000 or 4,000 feet. The range stretches southward with an altitude of between 4,000 and 5,000 feet to Mount Hood, which rises to an altitude of 11,225 feet above the sea.

This mountain stands on the crest of the range, in latitude 42° 22′ 23″, longitude 21° 42′ 00″. Its summit is 22 miles south of Columbia River. It is as prominent a feature in the landscape from the Columbia and Willamette Valley as is Shasta in northern California. Seen from the east or west its summit is a sharp cone, while from the south its top is broad, suggesting the width of the crater which formerly occupied it. The south side of this crater is almost entirely eroded away, leaving only a rock upon its southern slope, "Crater Rock", to represent this part of the rim. On the north, on the other hand, the rim is nearly intact.

Mount Hood, like most other of the volcanoes of the Cascade Range, is built up of successive flows of lava and showers of ash, the ash greatly predominating. The ash is more abundant upon the southern slope than elsewhere, indicating a north or northwest wind as the prevalent air current when the volcano was in action.

Upon this mountain are eight small glaciers. The summit is almost surrounded by the gathering grounds of these glaciers, and for 2,000 feet below the top the mountain is, with the exception of narrow spurs separating these streams of ice, nearly covered by them. It is only on the south side that there is a broad stretch of mountain slope free of ice. Perhaps the most symmetrical as well as one of the largest of these glaciers is the Eliot, on the northeast side. It is perhaps half a mile in width and between 2 and 3 miles long. It heads under the summit and terminates at timber line, here about 6,000 feet above the sea. This glacier, like the others on this mountain,



MOUNT HOOD, FROM COOPERS SPUR.

flows in a shallow valley, showing that it has not been working a great while, or it would have cut deeper in the rather friable rock composing its bed.

East of the mountain, and separated from it by the upper valley of the East Fork of Hood River, is a broad plateau-like mountain, with a general elevation exceeding 5,000 feet and with summits exceeding 6,000 feet, such as Lookout and Badger mountains. This broad summit separates the drainage of Hood River from that flowing southward into White River and eastward to the plains.

On the south the mountain slopes down to a depression which is the lowest in the entire length of the range. It is known as Barlow Pass or Summit, and over it passes one of the earliest emigrant roads, known as the Barlow road. This summit is drained on the east by White River and on the west by the Sandy, whose branches, Salmon, Zigzag, and other streams drain most of the west face of Mount Hood. Salmon River flows west between great ridges of basalt for many miles before coming out into the Willamette Valley.

South of Barlow Summit the summit of the range rises gradually, reaching an altitude of 5,000 feet a little south of the forty-fifth parallel, north latitude. Olallie Butte, which rises from the crest of the range in latitude 44° 50′, has an altitude of about 8,000 feet. At its west base heads the Clackamas River, which, with its many branches, drains in a northwest direction the west slope of the range. A few miles farther south, in latitude 44° 40′, rises Mount Jefferson, one of the highest peaks in Oregon, and visible from the Willamette Valley 50 miles to the westward. Its altitude is 10,350 feet. The mountain is elongated in north-south directions and from a distance gives very little indication of its volcanic origin. Upon its upper slopes are several small glaciers, and snow and ice extend far down its sides. The west slopes between Jefferson and Olallie Butte are drained to the westward by the Breitenbush River, a tributary of the North Fork of the Santiam.

South of Jefferson the next summit in the range to attract attention is Three-fingered Jack, a wrecked volcano, standing in latitude 44° 28′. It appears to rise from a base about 4,000 feet high in many broad spurs, whose apex is crowned by the rugged rocks forming the summit. The peak is about 8,500 feet in altitude.

South of Three-fingered Jack, and near it, are numerous mountain craters, including Washington Crater, Hoodoo Crater, Sand Mountain, Hayrick Butte, Potato Hill, and Black Butte, all of which have been vents for lava. Farther south rises Mount Washington to an altitude of 8,500 feet, and about it are Belknap, Black, and numerous other craters.

Between latitude 44° and 44° 15′ are the Three Sisters, which stand nearly in line upon the crest of the range. The distance from the North to the South Sister is only 5 miles. These rank among the highest peaks of Oregon, the altitude of the North and Middle Sister being between 10,000 and 10,500 feet, and that of the South Sister about 10,000 feet. Between the North and Middle Sisters, upon the west face of the

mountain, is a glacier of considerable breadth, extending from the summit far down upon the slopes.

The summit of the range between Jefferson and Three-fingered Jack is drained westward by the headwaters of the North Fork of the Santiam, which flows northward from Three-fingered Jack to a point west of Mount Jefferson, where it turns westward and flows down a slope of the range.

Opposite the head of the Santiam heads the McKenzie, which flows southward through a succession of lakes and underground passages to a point west of the north spur, where it also turns to the westward. West of the valley occupied by the headwaters of the Santiam and McKenzie is a succession of rather flat summits, forming by their arrangement a mountain range, with a summit altitude of 5,000 to 6,000 feet. This range is, in a certain way, parallel with the crest of the Cascade Range proper.

South of the Sisters the range becomes broader and more elevated, but contains no notable summits until Diamond Peak is reached. Among the many volcanic buttes worthy of mention are Bachelor Butte, 9,000 feet; Saddle Mountain, 7,000 feet; The Twins, 7,000 feet; Maiden Peak, 7,500 feet. Diamond Peak stands in the approximate latitude of 43° 30′, and rises to an altitude of 8,250 feet.

Between the Sisters and Diamond Peak the east face of the range is drained by the West Fork of the Deschutes River, the west face by the South Fork of the McKenzie, and by numerous branches of the Willamette, such as its North Fork, Salmon Creek, Salt Creek, Trout Creek, and the main stream. Near Diamond Peak there are upon and near the summit many lakes, among them Waldo Lake, the head of the North Fork of the Willamette, Odell and Davis lakes upon the West Fork of the Deschutes River, and Crescent and Summit lakes, which drain to the Deschutes.

The Willamette has its source in the Cowhorn Mountains, a few miles southeast of Diamond Peak, which rise to a height of 7,990 feet. The river and its branches flow mainly in narrow valleys closely walled by heavy mountain spurs. South and west of this river stretches a high, broad spur, known as the Calapooya Mountains. This, which has almost the magnitude of a distinct range, leaves the main divide at Cowhorn Mountains, and stretches northwest with a slightly sinuous course to the edge of the Willamette Valley.

South of Diamond Peak the next notable summits are Mount Thielsen and Mount Bailey, standing in the same latitude, the former with an altitude of 9,250 feet, the latter with an altitude of 8,085 feet. Between them is Diamond Lake, drained by the North Fork of the Umpqua River. Still farther south, just below the forty-second parallel, north latitude, is Mount Mazama, inclosing the celebrated Crater Lake.

Mount Mazama, or Crater Lake Mountain, stands upon the crest of the Cascade Range, here a broad plateau, in southern Oregon, in latitude 42° 57′, longitude 122° 7′. The range here has an average altitude of about 6,000 feet, above which Mount

A. HOGBACK AND CRATER ROCK, ON MOUNT HOOD, FROM SUMMIT.

B. WHITE RIVER GLACIER, MOUNT HOOD.

Mazama rises over 2,000 feet, or to an altitude above sea of 8,200 feet. Around it are numerous smaller mountains, all of which are of volcanic origin, among them being Crater and Scott peaks, Red Cone, and Timber Crater.

Most mountains rise to summits more or less sharp, but Mount Mazama rises to a circular ridge, which surrounds completely a pit or crater filled with water and known as Crater Lake. This lake is nearly circular, with an average breadth of 5.7 miles. The cliffs which surround it rise 2,000 feet above the water, while the maximum depth of the lake is nearly as great, leaving the lake bottom little over 4,000 feet above sea level. The lake contains a small island, Wizard Island, which rises 800 feet above its level, and in whose summit is a small crater. That Mount Mazama is but the base of a much higher peak which has been decapitated is apparent at once. The form of the stream canyons at the rim indicate that they formerly extended higher up and have been cut off, since each one heads in a notch or gap in the rim. This is seen at the head of Sand, Sun, and Anna creeks. If these streams had developed under present conditions, it is not at all probable that they would have as yet eroded their headwaters back so far as to cut these deep, broad notches in the rim, since they are young streams.

The question then arises, Was the summit of the mountain blown out, or did it sink in? If the former, we should expect to find much of the material on the rim and slopes, but a careful search has failed to discover any. The rim is made up mainly of lava, cooled and hardened from a liquid form. It is believed that the cavity now partly occupied by Crater Lake was formed by the sinking in of the upper parts of the mountain. Wizard Island is a secondary crater, raised within the main cavity.

It is estimated that were the mountain restored to its dimensions before the catastrophe which decapitated it, it would, in height as well as in horizontal dimensions, be comparable with Mount Shasta; i. e., that its altitude was at least 14,000 feet above the sea.

Between the Cowhorn and Mount Mazama the western slope is drained by the forks of Umpqua River, while south of Mount Mazama, and, indeed, the western slopes of the mountain itself, are drained to the Rogue. Mount Scott is a subsidiary cone of Mount Mazama. Since the decapitation of the latter mountain Mount Scott is the higher of the two, rising to an altitude of 9,128 feet, its summit being only 2 miles distant from the crater's rim. Southwest of Mount Mazama, and distant from the crater's rim about 7 miles, rises Union Peak to an altitude of 7,881 feet. Following the range southward, the next and last volcanic peak of importance is Mount Pitt, standing in latitude 42° 26′, with an altitude of 9,760 feet.

More detailed descriptions of the topography of the range contained within the reserve will be found in the description of townships in succeeding portions of this report.

CLIMATE.

The climate of the Cascade Range in Oregon is characterized by heavy precipitation, greatest at its northern end and diminishing progressively southward. Unfortunately, there are but very few observations in or near the range from which to obtain a measure of the amount. Indeed, the only stations known to me are at or near the Columbia River. Three of them are on the Columbia, namely, Cascade Locks, which has an annual rainfall of 80 inches; Hood River, with 43 inches, and The Dalles, with 16 inches, showing a progressive and rapid diminution of precipitation eastward. At Bull Run, which is well down the slope of the range and south of the Columbia River, the rainfall is 81 inches, while at Government Camp, near the summit of Barlow Road, at an altitude of a little below 4,000 feet, the precipitation is 104 inches. At greater altitudes the precipitation is of course larger, unless the increase in altitude is compensated by a reduction in latitude.

The precipitation throughout this region occurs almost entirely during the colder half of the year. In the summer time there are occasional showers; but, in all probability, three fourths of the precipitation comes during the rainy season, which extends from November to May.

CLASSIFICATION OF LANDS.

The total area of the reserve is 4,883,588 acres. The following table classifies land of the reserve as forested, burned, open, etc.:

Classification of lands in Cascade Range Forest Reserve.

	Acres.
Forested	4,161,764
Burned	377,171
Open	266,746
Logged	5,589
Cultivated	630
Water surface	27,568
Glaciers and barren	44,120

It appears from the above table that no less than 85 per cent of land in the reserve is forested; that only 8 per cent, or 1 acre in 12½, is burned; that only 5 per cent, or 1 acre in 20, is open country, and that 1 per cent of the land consists of barren rocks, ice, etc., the remaining 1 per cent consisting of water surface, of logged and cultivated land.

TIMBER.

The total stand of timber upon the reserve slightly exceeds 50,000,000,000 feet. Lying upon both sides of the Cascade Range, and with a considerable range in altitude, the species are quite varied, although the timber consists almost entirely of

A. MOUNT JEFFERSON, FROM GRIZZLY FLAT.

B. MOUNT WASHINGTON.

conifers. The following table gives the estimated stand of the different species of timber, with the percentage which each forms of the total stand:

Amount and percentage of timber species in Cascade Range Forest Reserve.

Species.	M feet B. M.	Per cent.
Red fir	27,088,892	54
Noble fir	3,244,033	6
Lovely fir	2,277,239	4
White fir	1,064,085	2
Subalpine fir	169,541	.....
Spruce	242,999	.....
Yellow pine	3,445,627	7
White pine	689,746	1
Lodgepole pine	689,639	1
Sugar pine	13,275	.....
White-bark pine	3,120	.....
Red cedar	914,578	2
Incense cedar	63,465	.....
Alaska cedar	5,346	.....
Mertens hemlock	4,368,398	9
Patton hemlock	5,612,693	11
Tamarack	126,848	3
Juniper	1,915	.....
Oak	14	.....
Cottonwood	294	.....
Total	50,021,747	100

From the above it appears that red fir forms much more than half the timber upon the reserve; that the species the most numerously represented, next to red fir, are the two hemlocks, which jointly comprise one-fifth of all the timber. Ninety-five per cent of all the timber consists of red, noble, lovely, and white fir, the pines and the hemlocks.

Three-fourths of all the timber stands upon the west side of the summit of the range, and one-fourth only upon the east. The wide difference between the species upon the east and west sides of the summit is illustrated in the following table, showing in each of these two areas the per cent of the total stand represented by different species.

Percentage of species on east and west sides of Cascade Range.

Species.	East of summit.	West of summit.
Red fir	14	63
Mertens hemlock	8	9
Noble fir	6	6
Lovely fir	3	5
Cedar	1	2
Patton hemlock	16	9
White fir	5	1
White pine	1	2
Subalpine fir	1	1
Spruce	2	.....
Tamarack	1	.....
Yellow pine	37	1
Lodgepole pine	5	1

The prevalent species upon the west of the range is, of course, red fir, which forms 63 per cent of all the timber, hemlocks being the next most common. East of the range, on the other hand, yellow pine is far the most prominent, comprising 37 per cent of all the timber, followed by Patton hemlock with 16 per cent, and red fir with 14 per cent.

The average stand of timber upon the timbered area of the reserve is 8,200 feet per acre, being much larger upon the west side of the range than upon the east. The stand of timber is small near the summit of the range owing to adverse climatic conditions. On the whole it diminishes southward owing to diminishing rainfall. This diminution southward is particularly noticeable on the west side of the range, the average stand maintaining itself east of the range much better. Furthermore there is a change in the distribution of species southward, also owing to the reduction in rainfall. In the northern part of the range yellow pine is confined to the east side of the range, there being none whatever on the west. It is only in township 22 south that it appears on the west side of the range in commercial quantity, thence southward it increases upon this side of the range, and in the southern part of the State becomes quite an important component of the forest. Together with it is associated throughout a small proportion of sugar pine. The incense cedar comes up from California, and extends into the State half way up the range in commercial quantity.

A. MOUNT MAZAMA AND CRATER LAKE.

B. MOUNT THIELSEN, FROM THE SOUTH.

NORTHERN PORTION OF CASCADE RANGE FOREST RESERVE.

By H. D. Langille.

AREA EXAMINED.

The area considered in this report includes the northern part of the Cascade Range Forest Reserve, the Hood River Valley, and the small areas lying between the reserve and the Columbia River. It is situated in the northern part of the State of Oregon, in Wasco, Multnomah, and Clackamas counties, and comprises an area of 523,072 acres, contained in 31 whole or fractional townships, of which 24, containing 413,278 acres, are in the reserve.

The area is 31½ miles in width at township 4 south, and narrows to 3 miles in township 1 north, range 9 east. Adjoining the northern end of this area, on the west, is the Bull Run Forest Reserve, which covers the summit and western slope of the mountains north of the Sandy River.

The west half of township 1 south, range 10 east, was afterwards excluded from the reserve because of its value for agricultural purposes. On July 1, 1901, a proclamation was issued adding to the reserve the south half of township 1 and townships 2, 3, and 4 south, range 11 east, which covers the greater part of the timbered area of the eastern slope of the mountains. Besides the reserved area described, detailed examinations were made of townships 1, 2, and 3 north, range 9 east, and approximates of townships 1, 2, and 3 north, range 10 east, are given.

TOPOGRAPHIC FEATURES.

The dominant topographic feature of this region is Mount Hood, one of the grand chain of snow-clad peaks that rise from the broad crest of the Cascade Mountains and stand in sentinel-like array along the range, marking the line of natural division between the widely different climatic and physical zones which extend eastward and westward from their summits.

The mean altitude of the Cascade Range is, approximately, 4,500 feet above the level of the sea, and this level is deeply broken only at the great gorge where the waters of the mighty Columbia have cut their way through from the great basin to reach the Pacific Ocean. Southward from the bold basaltic walls of this gorge,

which rise almost perpendicularly to an altitude of over 4,000 feet, the narrow meandering crest line maintains a comparatively unbroken level until the slope of Mount Hood is reached. South of the mountain the range broadens, and the divide is difficult to trace from a distance. Eastward from the crest the slope is gradual toward the treeless plains of eastern Oregon, but toward the west extend long, rugged ridges rising abruptly from the deep canyons to elevations which are often higher than those of the main divide.

Mount Hood is a volcanic cone 11,225 feet in height. That it was much higher in ages past is evident from the irregular semicircular form of its southern slope and the remnant of a former rim known as Crater Rock. Volcanic eruptions and the erosion of ages have shattered and torn down great masses of rock from its southern side and reduced it to its present height. On the south side, a thousand feet or more below the summit, the old crater still remains, and steam is constantly issuing from it. Along the eastern rim in many places the rocks are hot, and sulphurous fumes rise from numerous fissures. Eight well-defined glaciers, differing in length from 1.25 to 2.30 miles, and aggregating 2,240 acres, sweep down the different slopes. Observations made during the past few years by the writer show that these glaciers at this period are slowly diminishing and receding.

From the mountain and its fields of perpetual snow and ice flow the more important streams which drain this area. The northern and eastern slopes are drained by Hood River northward to the Columbia. The western and southern drainage, which covers a wide area, unites to form the Sandy River, while White River heads in the glacier which bears its name and flows eastward through the plains to the Deschutes. Within the reserve all of these streams and their tributaries flow through deep, narrow canyons, but below the reserve, in the area included in this examination, the course of Hood River is through a valley having an average width of 5 miles, which is almost all excellent agricultural land.

CLIMATE.

As described in previous reports on the climate of the Pacific northwest, the Cascade Mountains are important factors to be considered in their relation to climatic conditions.

The prevailing winds of this region are from the southwest, bearing the warm, humid atmosphere from the sea inland across the Coast Range and the intervening lowlands to the barrier formed by the high summits of the Cascades. Here the clouds condense and break against the slopes, causing an excessive rainfall along the western side, while the plains on the eastern slope suffer from want of the precipitation thus intercepted. The following table, for which the writer is indebted to Mr. Willis L. Moore, Chief of the Weather Bureau, shows clearly the effect of this interception:

Precipitation, in inches and hundredths, in Oregon.

Year.	Cascade Locks.	Hood River.	The Dalles.	Government camp.	Bull Run.
1875	.....	.....	25.68	.....	.....
1876	.....	.....	15.34	.....	.....
1877	.....	.....	17.53	.....	.....
1878	.....	.....	13.53	.....	.....
1879	.....	.....	21.56	.....	.....
1880	82.01	.....	13.61	.....	.....
1881	98.91	.....	21.92	.....	.....
1882	82.53	.....	15.54	.....	.....
1883	76.87	.....	12.18	.....	.....
1884	71.08	.....	.....	.....	.....
1885	66.15	.....	.....	.....	.....
1886	68.41	.....	.....	.....	.....
1887	100.67	.....	.....	.....	.....
1888	59.83	.....	.....	.....	.....
1889	41.60	.....	.....	.....	.....
1890	70.96	.....	12.18	.....	.....
1891	87.35	36.68	12.19	.....	.....
1892	.....	32.82	11.97	.....	.....
1893	89.60	54.17	17.97	.....	.....
1894	94.22	48.29	18.02	.....	.....
1895	71.03	.....	13.88	.....	.....
1896	95.37	51.36	16.76	124.35	.....
1897	88.67	46.87	16.60	103.80	.....
1898	76.28	31.07	7.58	87.93	.....
1899	97.95	44.18	16.74	124.35	.....
1900	76.73	.....	13.62	80.92	80.87
Total	1,596.22	345.44	314.40	521.35	80.87
Mean	79.81	43.18	15.72	104.27	.....

From this it appears that the annual rainfall is excessive at Cascade Locks and very light at The Dalles, while Hood River, situated midway between these stations, has an average rainfall of a little less than the mean annual precipitation of these three stations. This demonstrates the effect of this contact of the clouds with the mountain range.

Ordinarily no rain falls from the 1st of July to the latter part of September. The rainy season begins usually in the early part of November and continues until May. The climate is mild, the thermometer rarely falling to zero at the lower elevations. The snowfall is heavy in the mountains, varying from 4 to 10 feet in depth, but along the Columbia River not more than a few inches of snow fall at one time during an ordinary winter. Snowstorms are usually followed by rains and warm

Chinook winds, which sweep the snow off the mountains, causing extreme freshets in all the streams.

MINERALS AND MINING.

Up to the present time indications of minerals have been found in only two places, and these do not warrant the opinion that they will ever be found of much value. Gold has been found along the Lake Branch of Hood River, about 2 miles below Lost Lake, but not in sufficient quantity to justify development. At the base of the divide, east of the East Fork of Hood River, under Lookout Mountain, there is an extensive outcropping of gray porphyry containing white pyrites of iron and strata of talc carrying some gold. Development work is being done to determine the extent and value of these deposits.

There are no mineral springs of any recognized value. On the Lake Branch, near the mouth of Laurel Creek, there is a small spring, the water of which is slightly warm and possesses some mineral properties, but no analysis of the water has ever been made.

CLASSIFICATION OF LANDS.

Classification of lands in northern portion of Cascade Range Forest Reserve.

	Acres.	Per cent of total.
Timbered area	280,616	67.90
Burned area	85,731	20.75
Cut area	3,369	.81
Grazing area	4,136	1.00
Restocked area	20,153	4.88
Cultivated area	630	.15
Glaciers	2,280	.55
Barren area	15,770	3.82
Water surface	593	.14
Total	413,278	100.00

Areas of glaciers on Mount Hood.

	Acres.
Newton Clark Glacier	425
White River Glacier	170
Zigzag Glacier	330
Sandy Glacier	290
Little Sandy Glacier	80
Ladd Glacier	230
Coe Glacier	320
Eliot Glacier	395
Total	2,240

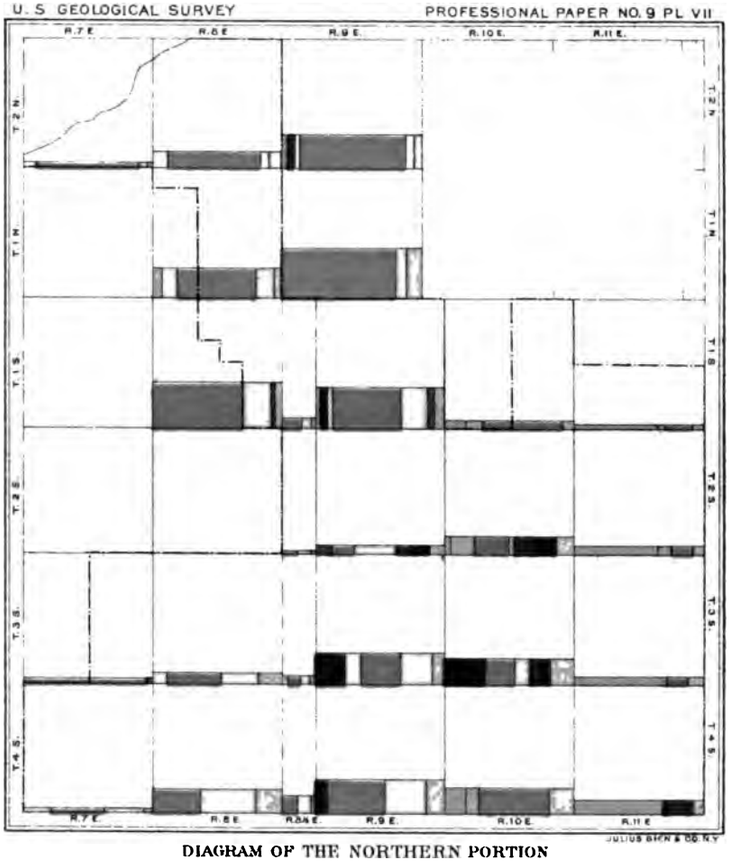


DIAGRAM OF THE NORTHERN PORTION

OF THE

CASCADE RANGE FOREST RESERVE, OREGON

(MOUNT HOOD AND VICINITY)

showing stand and mercial species of timber

Vertical scale of stand = billion feet B.M

SPECIES

Yellow pine | White fir | Noble fir | Lovely fir | Red fir | Hemlock | Spruce | Tamarack | Cedar | All other species

TIMBER.

SPECIES.

The 280,616 acres of timber in the reserve contain 4,465,431,000 feet of standing timber, or an average stand of 16,000 feet per acre. The trees comprising these forests are:

CONIFEROUS TREES.

Timber species in northern portion of Cascade Range Forest Reserve.

Yellow pine	Pinus ponderosa.	Mertens hemlock	Tsuga mertensiana.
White pine	Pinus monticola.	Patton hemlock	Tsuga pattoniana.
Lodgepole pine	Pinus murrayana.	Red cedar	Thuja plicata.
White-bark pine	Pinus albicaulis.	Alaska cedar	Chamæcyparis nootkatensis.
White fir	Abies grandis.		
Noble fir	Abies nobilis.	Engelmann spruce	Picea engelmanni.
Lovely fir	Abies amabilis.	Tamarack	Larix occidentalis.
Subalpine fir	Abies lasiocarpa.	Incense cedar	Libocedrus decurrens.
Red fir	Pseudotsuga taxifolia.	Yew	Taxus brevifolia.

DECIDUOUS TREES.

Pacific oak	Quercus garryana.	Maple	Acer macrophyllum.
Cottonwood	Populus trichocarpa.	Chinquapin	Castanopsis chrysophylla.
Quaking asp	Populus tremuloides.	Alder	Alnus oregona.

Of the latter class only the first two species are sufficiently abundant to form a percentage of the total forest. The following table shows the total stand of each species, and the percentage of the total which each species comprises:

Stand of timber, by species, in northern portion of Cascade Range Forest Reserve.

Species.	M feet B. M.	Per cent of total.
Yellow pine	376,488	8.43
White pine	38,173	.86
Lodgepole pine	58,672	1.31
White-bark pine	3,120	Less than 1.
White fir	125,334	2.80
Noble fir	319,344	7.15
Lovely fir	247,051	5.53
Subalpine fir	57,086	1.05
Red fir	2,014,264	45.18
Mertens hemlock	708,977	15.88
Patton hemlock	188,393	4.22
Red cedar	118,202	2.65
Alaska cedar	779	Less than 1.
Engelmann spruce	105,530	2.36
Tamarack	101,795	2.65
Incense cedar	1,915	Less than 1.
Oak	14	Less than 1.
Cottonwood	294	Less than 1.
Total	4,465,431	100.00

DEAD AND DEFECTIVE TIMBER.

Throughout the forest there is everywhere more or less timber which is dead or defective as a result of disease, old age, or overcrowding, but the greatest loss has occurred in the lodgepole-pine zone, where the Mertens hemlock, lodgepole pine, white pine, and white fir abound. The species named are the most susceptible to disease and injury, and comprise the greater part of the dead and fallen timber. The white pine has suffered a greater percentage of loss than any other species, and is rapidly disappearing from the forest. The cause of this is not apparent, but may be attributed to overcrowding by hardier species and the injury done by insects. The lodgepole pine is always a short-lived tree, which in time gives way to other species, and forms a dense litter. Mertens hemlock and lovely fir are most affected by wind shake, and in some places fully 60 per cent of these species is defective from this cause. The percentage of dead white fir is also large. It does not resist fire, and the heartwood decays at an early age, probably as a result of the soft, porous wood retaining so much water. The red fir is a hardy species, which usually resists disease until years after it has attained its growth, when heart decay begins, and finally leaves only a shell of sapwood. During the summer of 1894 the forests of this region were visited by great numbers of white butterflies, and as a result of this visitation a large percentage of the white-bark pine on the north slope of Mount Hood was killed. Specimens of this insect were sent to the Division of Entomology, which reported them to be *Neophasia menapia*. Polyporus is common on red fir and some other species when growing in moist places.

PRESENT AND PROBABLE FUTURE UTILIZATION OF TIMBER RESOURCES.

The abundant timber supply of western Oregon and Washington, standing contiguous to comparatively inexpensive means of transportation, precludes the probability of any considerable demand for the timber of this region for some time to come. The present low price of lumber, cut from the vast forests of the low-lying areas of the western slope, renders competition from more remote and inaccessible sections impossible except for local requirements.

Successful logging operations in these mountainous regions require that transportation lines be built, or the rough bowlder-strewn stream beds be cleared to prevent "jamming" and, in most instances, splash dams must be constructed to facilitate driving. The requirements necessarily imposed upon timber cutting within the reserves, by which only a certain percentage of the forest could be removed at a cutting, the care to be exercised to avoid injury to the remaining trees, and the expense involved in disposing of tops and litter would increase the cost of logs to such an extent as to render logging in the reserves at the present time unprofitable.

This is true of the western and northern slopes, where timber is abundant

A. MOUNT HOOD, FROM THE EAST.

B. MOUNT HOOD, FROM ABOVE TIMBER LINE ON SOUTHWEST SIDE.

outside the reservation, but along the eastern side the conditions are quite different. Nearly all the merchantable timber tributary to the vast "inland empire" is included within the present limits of the Cascade Reserve. Lack of transportation facilities at the present time limits the consumption and renders the timber supply of this section unavailable for the more eastern sections, but consumers living within a limit of 50 miles or less look to the forests of the eastern slope of the mountains for a large part of the wood required for domestic purposes.

From this region, therefore, will come the first and most numerous requisitions for permits to cut reserved timber. Lumber, shingles, fencing, and fuel will be required in constantly increasing quantities. Many inquiries were made of the writer by mill owners and farmers as to the proper method of procedure in securing permits to cut timber. At present the local demand is supplied from the townships recently added to the reserve on the eastern side. There are at present four sawmills in operation within this area. The most important of these is situated in the SW. ¼ of sec. 26, T. 4 S., R. 11 E., Willamette meridian. It has been built about nine years and has cut a large amount of timber. No figures of the total could be obtained. It has a capacity of from 12,000 to 15,000 feet per day, but is operated only during the summer months.

The timber in this vicinity is almost all yellow pine of two classes, viz, old trees, with an average diameter of 30 inches, and a younger growth about 18 inches in diameter. Only the best trees of the former class have been cut, leaving a fairly good stand of younger growth. Logs are hauled to the mill on trucks at heavy expense, two 4-horse teams delivering only 6,000 or 7,000 feet per day. The available timber supply is sufficient for one more season's cutting, after which time timber must be secured from the Government or the operation of the mill discontinued. Lumber is hauled by teams from this mill to points 40 to 50 miles distant, it being one of the principal supply points for all the territory lying eastward to and beyond the Deschutes River.

The price of lumber in the yard is $8 per thousand for common rough, and from $15 to $25 for clear finishing.

But little injury results to the forests from the cutting done, since most of the trees cut are fully ripe, and indications of decay and deterioration from old age are apparent. About two-fifths of the tree is used, and the remainder left in the woods. Owing to the upper part of the trunks being extremely knotty, they are unfit for lumber, or rather, if cut, would have to be sold at such a low figure in competition with the better grades that they could only be cut at a loss. Often there is a further loss of from 4 to 10 feet of the "butt cut," owing to fire scars or decay. Carelessness in felling also causes much damage to the standing growth. Conditions similar to these prevail at all the mills in this region.

There is a mill on Jordan Creek, in sec. 6, T. 2 S., R. 12 E., which is not in the reserve but is now dependent upon it for timber. Upon the extension of the reserve the mill was closed down pending arrangements by which the right to cut within its limits can be secured. This mill has been in operation since July 1, 1900. During that year about 500,000 feet of lumber were cut, and during the present season the output has been about 700,000 feet. This output, like that of the one last mentioned, is consumed locally and in Sherman County east of the Deschutes River.

A mill is now located on Tamarack Creek on the line between secs. 10 and 11, T. 2 S., R. 11 E., and has been situated there about sixteen years. During the four or five years previous to this time it was operated on Ramsay Creek west of the present site. During this period a large amount of timber has been cut by this and other mills which have long since disappeared. Nearly all of the area lying between Ramsay and Eightmile creeks has been cut over. Old roads penetrate the woods in every direction. In the more remote sections only the choicest trees have been cut, but on sections near the mill sites everything of merchantable size and quality has been taken. In many places 50 per cent of the forest has been logged. The capacity of this mill is now about 6,000 feet a day.

A mill in section 27 of the same township has a capacity of 10,000 or 12,000 feet a day and has been in operation about four years. The quarter section upon which it is located has been cut over and the mill is closed down for want of timber.

Another mill is located on Mill Creek in sec. 20, T. 1 S., R. 11 E. This plant has been built about sixteen years, but during the past six or seven years little cutting has been done. The available timber along the different branches of Mill Creek was exhausted, and everything left by the loggers has been cut into cord wood and posts. All of the output of this mill was flumed to The Dalles, a distance of 17 miles. The same flume is utilized for irrigation purposes, transportation of wood, and to supply The Dalles with water from Mill Creek.

Besides the cutting done in this territory by millmen, the amount removed by farmers has been considerable, and this demand will increase. Fuel, posts, shakes (split shingles), and building material have been taken from these forests from the time of the settlement of the country, and in certain localities the amounts have aggregated large quantities.

In townships 2 and 4 south, roads penetrate several miles into the woods to the swamps and dark, moist canyons, where cedar and tamarack abound, and in many places areas of considerable size have been culled of the best trees. Had the trees cut been utilized, the loss could not be deplored, but the extremely wasteful practice by which three-fifths or more of the trees have been left to burn or decay is deplorable indeed.

In township 4 there is scarcely a tree of promising appearance that has not been notched to test its splitting qualities and many from which only one cut has been

A.

B.

FRYER'S MILL, IN SEC. 8, T. 5 S., R. 10 E.

taken lie on the ground. Many young trees are cut. The farmers have not been deterred from this evil practice by the fact that this timber is now reserved. Evidences of recent cutting were frequently seen, and wagons loaded with posts were met on the roads.

Access to this timber is essential to the development of this region, but the unpardonable waste committed in the past should be stopped. There are millions of feet of timber which could be used profitably, and its removal would be beneficial to the forest, but the problem of transportation must be overcome before any large demands for its use will be made.

In the Hood River Valley the lumbering industry is one of importance, but the timber supply outside the reserve will be ample for some time to come. At present there are four sawmills in operation. One of these, located at the mouth of Hood River, has a cutting capacity of over 200,000 feet per day, but the difficulty in securing logs has, so far, prevented its working to its full capacity. During the present year two splash dams have been completed on Hood River, and it is expected that these will aid materially in driving logs down the stream. With some improvements made in the channel, little difficulty will be experienced in driving this stream except during stages of low water.

Mills have been in operation along the sides of the lower valley for many years, and immense quantities of lumber, railroad ties, and cord wood have been flumed to the railroad at a point 3 miles below the town of Hood River.

A large area of timber in the reserve is directly tributary to Hood River, and eventually will all be in demand. The privilege of cutting upon some of the more accessible tracts may be asked for in the near future. The tracts of valuable timber suitable for the manufacture of pulp are certain to attract investors before many years.

REFORESTATION.

The young growth of a timbered region, indicating as it does the character of the future forest, is very interesting. Everywhere there is more or less reproduction, varying from the strong, thrifty growth of the lower elevations to the stunted, distorted types of the alpine slopes, where the deep snows of winter bury the struggling saplings for months at a time. Where the forest cover is heavy and shuts out the sunlight the young trees are scattered and of very slow growth. The humus at the high elevation is deep and compact from the weight of snow, so that it is almost impossible for seeds to find their way into the soil, and these unfavorable conditions render it difficult for the young trees to keep pace with the old timber that is constantly dying. In all bodies of timber there is uniformity of size, showing that the growth all began at about the same time.

Certain species of cone bearers are better adapted to restocking than others, though the reason for this is not apparent. For example, young lovely firs are

abundant everywhere within the zone of that species, while noble fir, having a cone and seed of very similar size and nature, seldom germinates, and a sapling of that species is rarely seen. From many observations made in the zone of the hemlock and lovely fir it is apparent that these trees, from their ability to thrive under the most adverse conditions, are rapidly superseding the other species, and will, under natural conditions, be the sole components of the alpine forests. It is a striking fact that upon many areas where from 50 to 100 per cent of the present forest is red fir the reproduction is entirely hemlock and lovely fir. Should these forests be destroyed by fire it is probable that the red fir would rival these species in restocking the burn, but under natural conditions it is evident that the red fir will be displaced and the limits of the subalpine trees be much lower than at present.

Along the lower western slopes and the valleys, where the climate is mild and moist, red fir is the leader in reclaiming burned areas and cut-over lands. The tree fruits regularly, is a prolific bearer, and distributes its seed over a wide range from the edges of burns or from remaining seed trees, and in a few years the saplings, which grow rapidly and bear fruit at an early age, in turn cast their seed farther over the tract, and so on, from one generation to another, until the entire area is restocked.

The yellow pine in some instances does good work in stocking open spots in the timber, but seldom extends far beyond the parent tree. In the yellow-pine forests most of the young growth is red or white fir, which, taking advantage of the shade and moisture afforded by the yellow-pine cover, is growing rapidly, and will, in time, form a larger percentage of the forest than it has in the past. In the lodgepole-pine zone the reproduction consists of various species, the predominance of which depends upon the locality and slope. On the main range it is chiefly lodgepole pine or red fir, while along the eastern slope, toward the plains, it consists of white and red fir and yellow pine, in the woods, and tamarack, lodgepole pine, spruce, and other species in the burns. Tamarack has done more than any other species to restock the immense burns that have taken place in this part of the reserve. This is largely due to the fact that the thick bark of this tree resists fire better than any other species, and more seed trees are left to cast their seed upon the clean, loose soil and ashes immediately after a fire. The seeds are small and light, and are carried to remote places by the winds and covered deeply by the fall rains. In the spring a dense mass of seedlings covers the ground and grows rapidly. The thickets become so dense that it is impossible to travel through them. In time, only the fittest survive, and there remains a thrifty, vigorous stand of this valuable timber. Lodgepole pine reclaims large burned tracts and is valuable in promoting the growth of more desirable species.

A summary of the conditions existing at the present time indicates that the Mertens hemlock, lovely fir, tamarack, and Engelmann spruce are increasing; white fir, red fir, and yellow pine are maintaining their percentages, and noble fir, white

A. FRALEY'S MILL, IN SEC. 27, T. 4 S., R. 11 E.

B. CUT-OVER LAND IN T. 4 S., R. 11 E.

pine, and cedar, three of the most valuable timber trees, are rapidly decreasing. It is a noticeable fact that a timber species rarely succeeds itself upon lands adapted to various species, unless the forest has been destroyed by fire.

AGRICULTURAL LAND.

There is very little agricultural land included in the reserve. Above an elevation of 2,500 feet the climatic conditions are such that no crops, with the exception of hay, could be grown successfully. Late and early frosts are frequent and severe. Below this elevation, where the surface of the ground is sufficiently level and free from rocks, the land may be utilized for the production of crops suitable to that immediate locality, but these tracts are few in number, limited in area, and not of sufficient importance to warrant any modifications in the boundaries of the reserve, with the exception of the small area lying east of the lava beds in secs. 1, 12, and 13, T. 1 S., R. 9 E. These sections contain some good timber, but are mostly burned or barren. The soil is of an excellent quality, well adapted to fruit growing or other crops.

Outside of the reserve the Hood River Valley is good arable land, nearly all of which is located upon, and the work of clearing is going on rapidly.

WATER SUPPLY AND IRRIGATION.

A glance at the map of this region shows that the water supply is ample for all present and probable future demands, except in that part of the territory lying eastward of and contiguous to the reserve.

The snowfields and glaciers of Mount Hood insure a constant and perpetual supply for the watershed of Hood River, which drains the northern and eastern slopes of the mountain.

The Hood River Valley is famous far and near for the excellent quality of its fruits, and so remunerative has the business of fruit growing become that the value of fruit lands in the lower valley has risen to a high figure, and the acreage is rapidly increasing. The larger farms are being subdivided into 5-, 10-, and 20-acre tracts, which, when set to strawberries or fruit trees, yield large profits. At the present rate of growth the entire lower valley will soon be in cultivation.

Irrigation is beneficial to all crops, but for strawberries it is absolutely necessary, and an abundant water supply is required. Irrigation begins in May, and the "patches" are irrigated daily during the fruiting season to force the plants to yield to their fullest capacity. At present two large ditches are supplied by Hood River, and numerous smaller ones tap different tributaries, supplying a large amount of water to this section, but the supply available for use is already proving insufficient. When brought to its highest state of cultivation the demands of the valley upon the

stream will doubtless require a large part of its outflow, but that the supply will ever be inadequate is not probable.

Along the eastern side of the reserve is a wide territory, semiarid in its nature, which requires only the magic touch of water to bring it to a high state of productiveness. Here the demand for water is greatly in excess of the supply. Cut off from the drainage of Mount Hood by a high intervening range of hills, no glacial water, with the exception of White River, flows into this region, and a power company which has recently located its plant at the falls of White River has secured an injunction restraining all persons from diverting any water from this stream or its tributaries.

Numerous small creeks flow down from this dividing range, but during the summer and fall their flow is greatly reduced. Upon this range of hills, which rises at Lookout Mountain to an altitude of 6,283 feet, the snow is heavy and remains upon the ground until the latter part of May or the middle of June. During the period of spring rains, when the snows are melting, these hills give out a surprising volume of water, which, if retained in reservoirs constructed upon the natural sites afforded by the deep, wide canyons, would be of vast material benefit to this entire section.

Many thousands of dollars have been expended by the farmers and by corporations in attempts to construct canals, but as yet little or no benefit has been derived from their efforts. A corporation known as the Clear Lake Irrigation and Transportation Company expended thousands of dollars in the construction of a large ditch intended to divert the water of Clear Lake Creek at a point near Clear Lake and distribute it throughout the fertile sections of Juniper Flat, but after completing several miles of the canal the resources of the company were exhausted and the project abandoned.

The streams heading on the western slope of the Cascade Range are not utilized for irrigation, owing to climatic conditions which render irrigation unnecessary.

GRAZING.

The segregation of grazing lands from lands not otherwise classified in this report is difficult. No natural divisions occur except between lands which, by reason of peculiar conditions, are not adapted to tree growth. These occur infrequently and only in limited areas upon ridges or isolated summits having southern or western exposures or upon bottom lands of natural meadow. Grazing is confined to no particular localities. Sheepmen prefer to herd their "bands" upon high, open mountain slopes or in old burns, while cattle, roaming at will, find forage in all sections except the dense forests above the zones of deciduous shrubs. Forest fires are almost invariably followed by a growth of succulent herbage, consisting of tender sprouts of broad-leaved species, pea vine, grass, or other desirable forage. In consequence of this sheep grazing is almost wholly confined to the burned areas. The sheep and

A. TYPICAL FOREST IN EASTERN PART OF CASCADE RANGE RESERVE.

B. CHARACTERISTIC SCENE IN LODGEPOLE-PINE ZONE.

cattle that range in this reserve are owned entirely in eastern Oregon. They are wintered at or near the home ranch on the bunch-grass plains, but as soon as spring opens they are started toward the mountains, which are reached in April or early in May. The homeward drive begins in the latter part of September.

Under the present restrictions no sheep or cattle are permitted to be herded upon that portion of the Cascade Reserve lying north of the Barlow road and west of the east line of range 10. Prior to the addition to the reserve of those townships lying in range 11, this included all of the northern end of the reserve.

Along the foothills just east of the present line of the reserve the land is nearly all occupied by farmers, each of whom possesses cattle to the number of his ability to feed during the winter, and these foothills have been their summer range. Between these people and the sheepmen a strong ill feeling exists owing to the encroachment of the latter upon the cattle range. These farmers and cattlemen are earnest advocates of the forest-reserve system, and it was largely through their efforts that the recent additions to the reserve were made, but while they favor the reserves ostensibly for the perpetuation of pure-water supply it is apparent that other motives inspire their efforts. The restriction of herding sheep or cattle upon the reserves effectually debars the sheepman, since his sheep must be constantly herded, but the farmers' cattle are turned out in the spring to wander into the hills, following the ascending snow line until, during the summer, they reach every part of the summits and slopes of the eastern divide. One ranger asserted that there were between 600 and 700 head of cattle ranging along these hills in that portion of the reserve from which sheep are excluded. No action could be taken regarding them for the reason that they were not herded nor driven upon the reserve.

That some injury is done to the forests by these cattle is certain, but the extent of this damage can only be determined by close study of the question. The ground during the spring months becomes very soft and cattle sink deep at every step, thus destroying many small seedlings upon areas where restocking is in progress, but on the other hand they consume much rank vegetation that would otherwise form a dense litter of inflammable material. Nearly all the streams which find their sources in these hills flow from the swampy outlets of subterranean reservoirs, and here the cattle range constantly, causing positive discoloration and foulness in the water from the manure dropped and trampled into the soft loam.

That the effects of sheep grazing are injurious to the forest was conclusively demonstrated in many places. This injury, however, like that done by cattle, is largely confined to recent burns where young seedlings are springing up. Along the Barlow road, near the tollgate, many young lodgepole pines were seen which had been stripped of their leaves and the bark peeled off by sheep. This, however, occurs only in instances of extreme hunger, where there are no other forms of vegetation.

The most valuable sheep range at the present time is along the range of hills forming the divide between Still Creek and Salmon River. This is also a famous huckleberry patch, to which the Indians flock during the berry season, bringing with them large numbers of horses. Sheep are grazed in all accessible parts of the reserve south of the Barlow road.

After careful examination into this subject, the writer is of the opinion that grazing should be prohibited upon all burned areas during the period of time required for seedling trees to attain sufficient size and strength to resist the effects of trampling. Herding upon sparsely timbered slopes where the soil is of loose, sandy nature should be prohibited at all times. The injury done by trampling and the sharp cutting of hoofs is irreparable. The soil-binding roots and fibers are destroyed and erosion rapidly follows, resulting finally in a barren, rocky condition of the soil. Adherence to these restrictions would do much to solve the problem of the utilization of the reserve ranges and at the same time promote the best interests of the forests and water supply.

FOREST FIRES.

Forest fires within this area have been extensive and very destructive. As shown in the table of classification, the area burned is 85,731 acres, or 20.75 per cent of the total. These burns have taken place in all parts of the reserve, and are so distributed that their occurrence can not be attributed to any particular cause, but rather demonstrates the fact that wherever men go fires follow.

Prior to the establishment of the Cascade and Bull Run reserves and their patrol by officers, fires raged in different parts of the mountains every summer, and no effort was made to prevent or check them. Doubtless many fires were set by sheepmen to increase the acreage of range land, and hunters, fishermen, travelers, campers, and others thoughtlessly left their fires to spread, or deliberately set them to destroy hornet nests or obstructions in roads, trails, or the forest. The sentiment of the people had not been awakened to an appreciation of the value of the forests, and they were looked upon as nobody's property for which no one was responsible.

Following the establishment of the reserve, however, and the wide discussion of the questions involved, came a change of sentiment regarding the forests, and the policy of the Government was and is commended by a great majority of the people. This understanding of the purposes of the reserve, together with the wholesome effect produced by the presence of the rangers and the restrictions under which sheep are permitted to graze, has done much to decrease the number of fires. While the moral effect of the rangers' control is apparent, the actual work done by them is far from what it should be. Some of the men are energetic and do all they can to fulfill their duties, but others are absolutely worthless and inefficient. During the

A. FIRE-SWEPT LAND ON EASTERN SLOPE OF CASCADE MOUNTAINS.

B. YOUNG GROWTH ALONG GLACIAL STREAM.

past season fires were more numerous and destructive than at any other time since the organization of the patrol.

The most destructive fires have taken place south of Mount Hood along the old Barlow road and southward on the western slope to Salmon River. Some of these are said to have occurred as early as 1852, when the sections in the vicinity of Government Camp were burned. North of the mountain fires have been more numerous, but less extensive and destructive than on the south side. Besides the areas shown on the map as burned, the restocked lands may also be considered as burns, since the timber was destroyed by fire, and the present growth is of little or no value as timber. Adding the restocked area of 20,153 acres to that of the burns, gives a total of 105,884 acres burned, or 25.63 per cent of the total area. Basing this calculation upon an average stand of 16,000 feet of timber per acre, there have been 1,694,144,000 feet of timber burned in this area.

There are many wide tracts over which creeping fires have burned, killing a large percentage of the timber, but these have been considered as timber lands.

ROADS AND TRAILS.

Nearly all parts of the reserve are accessible by roads or trails. The old immigrant route known as the Barlow road, leading across the mountains just south of Mount Hood, from the Willamette Valley to eastern Oregon, has been in use since the early fifties, and is now owned and controlled by a corporation which demands toll from all travelers. It divides at the Summit House, and the southern branch, known as the Oak Grove road, bears southward toward the interior and reaches the settlements at Wapinitia.

On the eastern slope, in Ts. 1, 2, and 4 S., R. 1 E., a number of wagon roads have been cut to reach the cedar in the mountains. The Hood River Valley is traversed by wagon roads, and a stage road leads from Hood River, to Cloud Cap Inn at timber line, on the north side of Mount Hood.

Under the direction of the forest supervisor a trail has been constructed from the head of Eightmile Creek southward along the divide to White River, and thence to the Barlow road and southward to Mount Jefferson. Old Indian and sheepmen's trails lead to various parts of the reserve, but many of them are badly obstructed by fallen timber.

PRIVATE HOLDINGS AND IMPROVEMENTS.

Besides the numerous holdings located along the Columbia River, private ownership of lands in the reserve extends to various townships. In T. 1 S., R. 8 E., 2,040 acres of timber land have been purchased. In T. 1 S., R. 11 E., 1,200 acres have been purchased and 480 acres are held under homestead filings. In T. 2 S., R. 11 E., 760 acres have been purchased for their timber, and 3,840 acres located as home-

steads. In T. 4 S., R. 11 E., 2,760 acres are held as homesteads, and 280 acres have been purchased. Most of the filings in this township were made by bona fide settlers who are clearing their places and making their homes upon them, but in Ts. 1 and 2 S. no such effort has been made. The land is of little or no value for agricultural purposes, and since the locations were made just prior to the inclusion of this area in the reserve, it is apparent that the purpose of the locators was to secure the timber or to dispose of their rights to the Government for scrip which could be placed on more valuable lands elsewhere. A rough board shack 10 by 12 feet in size, with a shed roof, is usually the extent of their improvements, though some have built a few rods of fence and dug up a small patch of ground.

Government Camp and Summit House are situated in T. 3 S., R. 8½ E. The former is a summer resort and headquarters for the many who visit the south side of Mount Hood during the season. The Summit House is located at the junction of the Oak Grove and Barlow roads. Travelers are entertained, and pasture is furnished in a large natural meadow. A cash patent has been given to the SE. ¼ of sec. 32, T. 4 S., R. 9 E. This controls the outlet of Clear Lake, which is a valuable reservoir site.

On the north side of Mount Hood, at the foot of Elliot Glacier, is Cloud Cap Inn, a summer hotel built in 1889.

DESCRIPTIONS OF TOWNSHIPS.

Township 3 North, Range 8 East.

The small portion of this township lying south of the Columbia River is comprised of overflow lands and a bench from which the greater part of the timber was cut at the time when the Oregon Railroad and Navigation Company's railroad was constructed, and cord wood is being cut from the remaining trees, so there is but little left. The land is held by individuals, and will be good for agricultural purposes when cleared.

Classification of lands in T. 3 N., R. 8 E.

	Acres.
Grazing area	315
Cut area	405
Cultivated area	20

Township 2 North, Range 7 East.

The Columbia River bluffs occupy all of that portion of this township lying south of the river. The timber along these walls is of little value, but along Eagle and Deadmans creeks there is a fair stand of merchantable size and quality. This could be logged by skid roads, but the gorge of Eagle Creek is very narrow. The ground is very rocky, with many perpendicular bluffs of rock. The towns of Cascade Locks, Bonneville, and Warrendale are in this township.

A. BARLOW ROAD ABOVE TOLLGATE.

B. CATTLE GRAZING IN RESERVE WITHIN THE AREA UPON WHICH GRAZING IS PROHIBITED.

Classification of lands, T. 2 N., R. 7 E.

	Acres.
Timbered area	7,130
Burned area	977
Cut area	272
Grazing area	288

Stand of timber species in T. 2 N., R. 7 E.

	M feet B. M.
Total	50,790
White pine	337
White fir	1,003
Noble fir	5,028
Lovely fir	3,179
Red fir	37,081
Mertens hemlock	3,407
Patton hemlock	219
Red cedar	488
Cottonwood	48

Forest conditions in T. 2 N., R. 7 E.

Average height clear timber.....feet..	45
Average diameter.....inches..	18
Depth of humus.....do....	1½
Litter	Medium.
Reproduction	Light.

Township 2 North, Range 8 East.

The Columbia River and the deep-forked canyon of Hermann Creek cause this township to be extremely rough and rugged. The conditions are not favorable to timber growth. The bluffs along the Columbia rise precipitously, to an elevation of 4,000 feet, to comparatively level but narrow ridges, on which the timber is small and rough and comprised mainly of subalpine species.

Along the East Fork of Hermann Creek, however, there is a body of excellent red fir of large size. A large part of this canyon has been burned over. On the divide between Hermann and Green Paint creeks there is an old burn now partly restocked and overgrown with huckleberry bushes. Formerly this was a favorite haunt of the Indians, but the white man's fires have blocked their trails, and their visits have been discontinued. At the extreme headwaters of Green Paint Creek, under the divide, there is a heavy stand of valuable timber.

The soil everywhere is extremely rocky, and many spots of exposed shell rock appear. There is scarcely enough soil in many places to sustain a forest growth.

Except in the small areas at the head of Green Paint Creek and along the small creeks flowing into the Columbia, it is not probable that any attempt will be made to cut the timber of this township for many years.

Classification of lands in T. 2 N., R. 8 E.

	Acres.
Timbered area	14,597
Burned area	5,007
Cut area	970
Grazing area	155
Cultivated area	335
Restocked area	1,496

Stand of timber species in T. 2 N., R. 8 E.

	M feet B. M.
Total	178,612
White pine	473
Lodgepole pine	690
White fir	305
Noble fir	5,807
Lovely fir	18,221
Subalpine fir	1,377
Red fir	131,784
Mertens hemlock	13,188
Patton hemlock	2,083
Red cedar	4,349

Forest conditions in T. 2 N., R. 8 E.

Average height clear timber.....feet..	42
Average diameter.....inches..	18
Depth of humus.....do....	2¼
Litter	Medium.
Reproduction	Light.

Township 1 North, Range 8 East.

The summit of the Cascade Range extends through this township from southwest to northeast and divides the watershed of the Lake Branch of Hood River and Green Paint Creek from Eagle and Hermann creeks which flow northward to the Columbia. The altitudinal range is from 1,500 to 4,900 feet. On the summits of the divide the timber is of little value, but in the canyons and on the slopes there is an excellent stand. On the east side of Eagle Creek, under Chinidere Mountain, it is exceptionally fine. West of the East Branch of Eagle Creek terrific fires have swept everything bare.

The ridges are very rocky, but in the canyons the soil is of good quality, though not deep.

All of the timber on the Lake Branch slope could be driven down that stream to the West Fork during freshets, but the Eagle Creek Canyon offers no means of access to its timber.

Classification of lands in T. 1 N., R. 8 E.

	Acres.
Timbered area	12,868
Burned area	2,637
Grazing area	58
Restocked area	441

Stand of timber species in T. 1 N., R. 8 E.

	M feet B. M.
Total	332,172
White pine	1,331
White fir	913
Noble fir	22,174
Lovely fir	40,211
Red fir	214,785
Mertens hemlock	32,387
Patton hemlock	12,751
Red cedar	7,562
Alaska cedar	58

Forest conditions in T. 1 N., R. 8 E.

Average height, clear timber ..... feet..	33
Average diameter ..... inches..	18
Depth of humus ..... do....	2¼
Litter	Medium.
Reproduction	Light.

Township 1 South, Range 8 East.

The basins of the West Fork of Hood River, Lost Lake, and Laurel Creek, which are included in this fractional township, contain the largest and most extensive stands of timber found in this region. The wide canyon of the West Fork has apparently been covered by sand and bowlders washed down from Mount Hood, and this deposit has been covered with sandy soil or black loam to a depth of 3 or 4 feet. The timber is mainly red fir, Mertens hemlock, and cedar of large size, but much of it is over-ripe and defective. Along the creek are many swampy spots in which the undergrowth is dense and on the ridges rhododendron forms tangled thickets, through which it is almost impossible to travel. White pine has been quite abundant throughout this area, but a large percentage is now dead.

The soil is gravelly sand, mostly very shallow and rocky. In some places not more than a foot of soil covers a formation of broken rock.

All of the timber is easy of access, and the topography of the township presents favorable opportunities for transportation. The West Fork and Lake Branch could be logged by means of splash dams. Lost Lake is a natural reservoir, in which an immense volume of water could be retained and flooded down the Lake Branch, or carried through the low pass southward to the West Fork.

Classification of lands in T. 1 S., R. 8 E.

	Acres.
Timbered area	8,306
Burned area	2,366
Water surface	208

Stand of timber species in T. 1 S., R. 8 E.

	M feet B. M.
Total	507,876
White pine	3,439
White fir	1,264
Noble fir	11,326
Lovely fir	13,025
Red fir	353,379
Mertens hemlock	107,605
Red cedar	17,838

Forest conditions in T. 1 S., R. 8 E.

Average height, clear timber ..... feet	41
Average diameter ..... inches	25
Depth of humus ..... do	2½
Litter	Medium.
Reproduction	Light.

Township 1 South, Range 8½ East.

This township lies along the western slope of the divide between the West and Middle forks of Hood River, and consists mainly of steep side hills or benches. The timber is of little value on the steep rocky slopes, but near the bottom of the canyon of the West Fork there is some good timber, mainly red fir. It is all tributary to the West Fork.

Classification of lands in T. 1 S., R. 8½ E.

	Acres.
Timbered area	5,375
Burned area	385

Stand of timber species in T. 1 S., R. 8½ E.

	M feet B. M.
Total	95,013
White pine	530
Lodgepole pine	1,892
White fir	122
Noble fir	770
Lovely fir	2,814
Red fir	65,363
Mertens hemlock	14,861
Patton hemlock	3,488
Red cedar	5,173

Forest conditions in T. 1 S., R. 8½ E.

Average height, clear timber	feet	42
Average diameter	inches	10
Depth of humus	do	2
Litter		Medium.
Reproduction		Light.

Township 1 South, Range 9 East.

This township includes the summit of the high, broad divide between the East and West forks of Hood River, known as Blue Ridge. All except a narrow strip on the western side is drained by the Middle Fork or its tributaries. East of this stream nearly everything has been burned and has grown up over the greater part to a dense growth of chaparral, or thickets of young trees. On the slopes of Blue Ridge and along Tony and Skookum creeks there is some magnificent timber. Along the lower slopes and canyons it is mainly red fir, but within the township almost every species is represented. Some excellent cedar grows in the swampy creek bottoms.

The soil is a fertile sandy loam, except on the ridges. The land lying between the Middle Fork and the east line of the township has excellent soil. The narrow strip lying east of the lava beds would be excellent farm land if cleared.

All the timber in this township is tributary to Hood River, to which it could be logged by means of skid roads and log chutes.

Classification of lands in T. 1 S., R. 9 E.

	Acres.
Timbered area	16,867
Burned area	5,035
Arable area	1,328
Barren area	750
Restocked area	388

Stand of timber species in T. 1 S., R. 9 E.

	M feet B. M.
Total	478,157
Yellow pine	900
White pine	2,486
Lodgepole pine	10,982
White fir	17,591
Noble fir	19,237
Lovely fir	26,845
Red fir	286,807
Mertens hemlock	69,726
Patton hemlock	26,357
Red cedar	15,861
Engelmann spruce	1,267
Tamarack	81
Cottonwood	17

Forest conditions in T. 1 S., R. 9 E.

Average height, clear timber ..... feet..	40
Average diameter ..... inches..	18
Depth of humus ..... do....	2
Litter	Light.
Reproduction	Medium.

Township 1 South, Range 10 East.

The greater part of this township has been burned over and has grown up to a dense tangle of willow, ceanothus, and other shrubs. The entire township was originally included in the reserve, but the western half has been excluded and homestead rights have been filed on nearly all of it. The eastern half includes the high divide east of the East Fork of Hood River, upon which rise numerous creeks that flow eastward toward the plains. There is some fairly good timber in the northeast corner of the township, but it is mostly small and rough. The top and the western slope of the divide consist of burned, restocked, grazing, semi-barren, brush, and timber land.

The locations in the western half of the township are mostly recent filings. The soil is an excellent red sandy loam with some black clay loam in the "swales."

The timber that is tributary to Hood River could be driven down that stream.

Classification of lands in T. 1 S., R 10 E.

	Acres.
Timbered area	10,121
Burned area	11,283
Cut area	5
Grazing area	235
Cultivated area	122
Restocked area	1,274

Stand of timber species in T. 1 S., R. 10 E.

	M feet B. M.
Total	77,571
Yellow pine	12,388
White pine	143
Lodgepole pine	822
White fir	10,231
Subalpine fir	46,684
Mertens hemlock	382
Red cedar	827
Engelmann spruce	1,298
Tamarack	4,570
Oak	113
Cottonwood	113

Forest conditions in T. 1 S., R. 10 E.

Average height, clear timber	feet	36
Average diameter	inches	18
Depth of humus	do	1
Litter		Medium.
Reproduction		Medium.

Township 1 South, Range 11 East.

Only the south half of this township is included in the reserve. It is entirely within the yellow-pine belt, but the red fir is more abundant than in similar ranges farther south. The timber does not extend as far eastward from the mountains as it does in more southern localities. Along the north slopes the red fir, white fir, and tamarack extend down almost to the reserve line, comprising from 10 to 20 per cent of the forest, while on the south slopes the yellow pine is almost the only tree. Along the east side of the township the southern exposures are almost barren of timber, but in places are densely covered by oak grubs. This is good grazing land during the fall and spring. Sheep and cattle devour everything. The soil is a light gravelly sand, mostly rocky, especially along the ridges where there is no forest cover to prevent washing.

Some cutting has been done on the sections north of Threemile Creek. Along Mill Creek everything has been logged. Cedar and tamarack have been taken along the creek bottoms, and many of the best pines cut for shakes. In the old burns the chaparral is very dense.

Logging could be done by means of skid roads, or tramways, but the canyons are deep and precipitous.

Classification of lands in T. 1 S., R. 11 E.

	Acres.
Timbered area	9,658
Burned area	240
Cut area	1,522
Restocked area	100

Stand of timber species in T. 1 S., R. 11 E.

	M feet B. M.
Total	47,117
Yellow pine	32,630
Lodgepole pine	36
White fir	1,582
Red fir	12,130
Mertens hemlock	36
Red cedar	94
Tamarack	609

Forest conditions in T. 1 S., R. 11 E.

Average height, clear timber ..... feet..	43
Average diameter ..... inches..	21
Depth of humus ..... do....	½
Litter	Light.
Reproduction	Light.

Township 2 South, Range 8½ East.

This fractional township lies just west of Mount Hood, and includes a portion of the barren land above timber line. The timber is of little value except in the northern end, along the canyons of the West Fork of Hood River. Above the timber line, about the sources of Zigzag, there is excellent grazing.

Classification of land in T. 2 S., R. 8½ E.

	Acres.
Timbered area	1,630
Grazing area	240
Barren area	3,890

Stand of timber species T. 2 S., R. 8½ E.

	M feet B. M.
Total	8,505
White fir	33
Lovely fir	647
Subalpine fir	80
Red fir	2,754
Mertens hemlock	179
Patton hemlock	4,290
Red cedar	64
Engelmann spruce	458

Forest conditions in T. 2 S., R. 8½ E.

Average height, clear timber ..... feet..	22
Average diameter ..... inches..	14
Litter	Light.
Reproduction	Medium.

Township 2 South, Range 9 East.

This township contains the summit of Mount Hood and the greater part of the barren slopes around it. A little more than one-half of its area is timbered. Streams radiate in every direction from the glaciers and snowfields of the mountain, forming a succession of canyons, some of which are deep and very precipitous. The wide altitudinal range, extending from 3,500 to 11,000 feet, favors many peculiar conditions of forest growth. Patton hemlock and white-bark pine reach the highest elevations on the mountain. The timber line varies from 6,000 to 6,500 feet, but on the southeastern slope white-bark pines grow at an elevation of 7,400 feet.

Above timber line are areas of vegetation which afford some grazing, and below are wide areas of open woods in which is an excellent growth of grass, but the soil is so light that the trampling of sheep would soon destroy the thin sod.

The soil is either light volcanic ash or glacial deposits of sand, gravel, and rock, and it erodes rapidly under the action of water.

The timber of this township is remote from natural means of transportation, so it is not probable that it will be in demand for some time.

Classification of lands in T. 2 S., R. 9 E.

	Acres.
Timbered area	11,560
Burned area	1,225
Grazing area	130
Barren area	7,845
Glaciers	2,280

Stand of timber species in T. 2 S., R. 9 E.

	M feet B. M.
Total	90,280
Yellow pine	277
White pine	435
Lodgepole pine	7,833
White-bark pine	1,937
White fir	865
Noble fir	506
Lovely fir	11,206
Subalpine fir	1,296
Red fir	15,848
Mertens hemlock	3,685
Patton hemlock	25,649
Red cedar	370
Engelmann spruce	8,416
Tamarack	11,957

Forest conditions in T. 2 S., R. 9 E.

Average height, clear timber, feet	26
Average diameter, inches	15
Depth of humus, do	2
Litter	Medium.
Reproduction	Fair.

Township 2 South, Range 10 East.

The western half of this township includes the deep canyon of the East Fork of Hood River, while the eastern half is a broad, comparatively flat ridge, upon which head Eightmile, Jordan, and other creeks, flowing eastward. Forest fires have devas-

Forest conditions in T. 2 S., R. 11 E.

Average height, clear timber ..... feet..	27
Average diameter ..... inches..	21
Depth of humus ..... do....	½
Litter	Medium.
Reproduction	Medium.

Township 3 South, Range 7 East.

Only the eastern half of this township is included in the reserve. Across this area, from southeast to northwest, extends a high precipitous ridge dividing Salmon River from Still Creek and Zigzag River. West of Salmon River is a similar range; hence the surface of this township is extremely rough and broken.

Almost the entire area has been burned over. Along the east side of Salmon River, from the reserve line to the bend of the stream, is a narrow strip of timber, mainly second growth, consisting of red fir mixed with maple and alder, averaging 10 inches in diameter. Above the bend, along the narrow river bottom, is the remnant of a once grand forest of red fir and cedar, which in some instances have attained a diameter of 8 or 9 feet. Only three or four trees remain on each acre, and a large percentage of these are defective, being very old trees which have long since reached maturity.

Above the forks of the river, extending through section 34, remains an excellent body of red fir which is estimated to be from 75,000 to 100,000 feet per acre. Many of the trees are dead, and the litter is very heavy, as it is all along the stream. Along Still Creek and Zigzag the conditions are similar to those described in T. 3 S., R. 8 E.

Reforestation is very good in all parts except on the divides above 3,500 feet. The soil is very rocky in all sections.

Classification of lands in T. 3 S., R. 7 E.

	Acres.
Timbered area	1,455
Burned area	5,315
Cultivated area	22
Restocked area	4,728

Stand of timber species in T. 3 S., R. 7 E.

	M feet B. M.
Total	32,330
Red fir	31,744
Red cedar	316
Mertens hemlock	270

Township 3 South, Range 8 East.

The surface of this township is broken by the deep canyons of Zigzag River and Camp and Still creeks. The wide canyon of Zigzag River is filled with a mass of

glacial sand and rocks, apparently carried down by the action of the stream from Mount Hood and deposited in this comparatively level basin. Upon this unfertile deposit little timber grows or ever has grown. It is now fairly well covered by a dense growth of young lodgepole pine. In some places there are clusters of small red fir, which have served to restock a part of the area, and the seeds have been carried up on the hillsides to more fertile soil, where there is now, in places, a dense growth of saplings. The growth of the young trees is very rapid. Almost the entire township has been burned over. Along Still Creek, in the western part of the township, there is an excellent stand of red fir, hemlock, and cedar, with noble fir higher on the mountain side. On the same creek, near the east line of the township, there is a similar growth, and between Government Camp and Zigzag is another body of good timber, including about 700,000 feet of Alaska cedar.

The southern part of the township includes a portion of the sheep range referred to in the description of T. 4 S., R. 8 E. The soil is all sand, gravel, and rock.

The limited areas of timber would not warrant the construction of means of transportation, but small portable mills could be employed to cut the logs on the ground.

Classification of lands in T. 3 S., R. 8 E.

	Acres.
Timbered area	5,320
Burned area	14,935
Restocked area	2,785

Stand of timber species in T. 3 S., R. 8 E.

	M feet B. M.
Total	122,602
White pine	414
Noble fir	4,228
Lovely fir	11,012
Subalpine fir	714
Red fir	51,675
Mertens hemlock	39,494
Patton hemlock	7,836
Red cedar	6,330
Alaska cedar	721
Engelmann spruce	178

Forest conditions in T. 3 S., R. 8 E.

Average height, clear timber, feet	42
Average diameter, inches	22
Depth of humus, do	1
Litter	Medium.
Reproduction	Medium.

Township 3 South, Range 8½ East.

The greater part of this fractional township is burned. Some good timber remains in the wide basin at the head of Mud Lake Creek and along Still Creek. This consists mainly of red fir and hemlock. On the slopes toward Zigzag the timber is Patton hemlock and other Alpine species.

The soil is very rocky sand.

Classification of lands in T. 3 S., R. 8½ E.

	Acres.
Timbered area	2,230
Burned area	3,435
Grazing area	95

Stand of timber species in T. 3 S., R. 8½ E.

	M feet B. M.
Total	61,524
White pine	752
White fir	300
Noble fir	2,805
Lovely fir	6,432
Subalpine fir	1,980
Red fir	20,555
Mertens hemlock	17,276
Patton hemlock	6,165
Red cedar	5,140
Engelmann spruce	119

Forest conditions in T. 3 S., R. 8½ E.

Average height, clear timber	feet	47
Average diameter	inches	23
Depth of humus	do	1½
Litter		Medium.
Reproduction		Light.

Township 3 South, Range 9 East.

This township lies southeast of Mount Hood, and includes a part of the barren land above timber line. It is drained by Hood, White, and Salmon rivers. The wide bottom of the canyon of White River is an immense deposit of rocks and sand which is constantly flooding down from the morainal deposits and barren ridges below the glacier.

Evidences of an old forest remain, showing that at one time this canyon was heavily forested, but now nothing of any value remains. The canyon at the headwaters of Hood River is very similar to that of White River, but the movement of débris has long since ceased and the basin is well covered with timber, most of which

is lodgepole pine, lovely fir, and Patton hemlock. On the sides of the canyons of these streams there is an abundance of timber of the finest quality, consisting mainly of noble and red fir.

At the head of the basin of Hood River, and on the White River divides, below timber line, are grassy slopes and alpine meadows, through which are scattered clusters of white-bark pine, subalpine fir, and hemlock. South of White River, where the forest has not been devastated by fire, there is generally a good stand of timber.

The soil is volcanic ash, sand, and rock. The timber in the Hood River Basin could be logged down Hood River, but the remainder could only be handled by small portable mills, and the output hauled or flumed to market.

Classification of lands in T. 3 S., R. 9 E.

	Acres.
Timbered area	14,900
Burned area	4,255
Grazing area	600
Barren area	3,285

Stand of timber species in T. 3 S., R. 9 E.

	M feet B. M.
Total	357,524
White pine	5,989
Lodgepole pine	4,951
White-bark pine	582
White fir	2,401
Noble fir	88,733
Lovely fir	46,046
Subalpine fir	3,343
Red fir	108,771
Mertens hemlock	31,577
Patton hemlock	46,393
Red cedar	4,184
Engelmann Spruce	11,119
Tamarack	3,435

Forest conditions in T. 3 S., R. 9 E.

Average height, clear timber ..... feet	29
Average per cent, clear timber	10
Average diameter ..... inches	19
Depth of humus ..... do	1½
Litter	Medium.
Reproduction	Medium.

Township 3 South, Range 10 East.

In altitudinal range this township varies from 3,300 feet to 6,200 feet. It is drained by the East Fork of Hood River on the west, Boulder Creek on the south, and Badger Creek on the east. The divide which separates the sources of these creeks from Hood River breaks abruptly to the latter stream, but the spurs which divide the waters of the various creeks slope eastward more gently toward the plains.

Along the crests of these ridges the timber is comprised mainly of true alpine species of small size and little value, but immediately below the summits, in the canyons and on the lower slopes, some excellent timber is found, consisting of noble fir, red fir, Engelmann spruce, tamarack, and yellow pine in the more eastern sections. In the broad basin of Hood River, below the deposits of glacial sand and rock, is a valuable body of spruce timber, and on the north slope, south of the bend of the stream, is a magnificent stand of noble fir.

Forest fires have devastated large areas, but the best timber remains uninjured. Cattle range over all of this township except the basin and slopes of Hood River.

The soil is a light volcanic sand with some gravel. Rock, loose and in place, occurs along the canyon walls. The timber tributary to Hood River could be flooded down that stream and the other sections logged by means of skid or tram roads along the creek bottoms.

Classification of lands in T. 3 S., R. 10 E.

	Acres.
Timbered area	19,050
Burned area	3,815
Grazing area	175

Stand of timber species in T. 3 S., R. 10 E.

	M feet B. M.
Total	302,181
Yellow pine	18,790
White pine	5,480
Lodgepole pine	1,569
White-bark pine	349
White fir	3,108
Noble fir	89,941
Lovely fir	17,394
Subalpine fir	905
Red fir	69,570
Mertens hemlock	5,317
Patton hemlock	24,321
Red cedar	1,477
Engelmann spruce	40,181
Tamarack	23,779

Forest conditions in T. 3 S., R. 10 E.

Average height, clear timber	feet	25
Average diameter	inches	16
Depth of humus	do	½
Litter		Medium.
Reproduction		Medium.

Township 3 South, Range 11 East.

This township is extremely rough and broken, except in the southeast corner. High spurs of the main divide extend eastward nearly across the township. Between these flow Badger, Tygh, and Jordan creeks, in deep canyons. Below the summits of these ridges the timber is mainly yellow pine, but on top and about the heads of the canyons this species gives way to tamarack, lodgepole pine, lovely fir, subalpine fir, and spruce of small size. Much of this has been scorched by fires, but reforestation is persistent, and in most areas dense. Young tamarack of small size forms 90 per cent of the forest cover in places about the head of Jordan Creek, promising a valuable forest for the future. The canyon of Badger Creek contains very little timber. Steep walls are on either side, exposing bold bluffs or shell rock slides.

Along the lower canyon of Tygh Creek, on the southern exposure, the timber is very light in places, consisting mainly of scrub oak. Restocking is generally good throughout the township. Red fir, white fir, and yellow pine are covering many places along the lower levels where the forest cover is light. The soil is gravelly sand of little depth, and mostly rocky. The available timber will probably be cut by small local mills. Trucks are used to haul the logs to the mills, owing to the fact that logs classed as merchantable are too widely scattered to warrant the construction of skid roads or tramways. This is true of the other townships in the yellow-pine belt.

Classification of lands in T. 3 S., R. 11 E.

	Acres.
Timbered area	21,580
Burned area	1,225
Cut area	200
Grazing area	35

Stand of timber species in T. 3 S., R. 11 E.

	M feet B. M.
Total	107,244
Yellow pine	78,289
Lodgepole pine	1,001
White fir	7,569
Noble fir	1,000
Lovely fir	441

	M feet B. M.
Subalpine fir	315
Red fir	14,823
Patton hemlock	189
Red cedar	81
Engelmann spruce	449
Tamarack	3,051
Incense cedar	22
Oak	14

Forest conditions in T. 3 S., R. 11 E.

Average height, clear timber ....feet..	23
Average diameter ....inches..	20
Depth of humus ....do...	½
Litter	Medium.
Reproduction	Good.

Township 4 South, Range 7 East.

This township lies on the western side of the reserve and covers the extremely rough area at the heads of Roaring River, South Fork of Salmon River, and Eagle Creek. The former stream is a tributary of the Clackamas. Terrific forest fires have swept over nearly all of this township, destroying the greater part of its timber. That which is left is along the summit of the high divide between Salmon and Roaring rivers, extending down the basin of the South Fork of Salmon almost to the township line. Along the summit of the divide the timber is mainly hemlock, lovely fir, and noble fir. Lower is a stand of almost pure red fir, very dense and thrifty, averaging 12 inches in diameter. Along Salmon River the old burns are rapidly restocking with an excellent growth of red fir from 4 to 6 feet in height. Huckleberries are everywhere, and there is good sheep range along the divides, but it is difficult of access.

Classification of lands in T. 4 S., R. 7 E.

	Acres.
Timbered area	6,560
Burned area	11,880
Restocked area	2,510

Stand of timber species in T. 4 S., R. 7 E.

	M feet B. M.
Total	45,993
Noble fir	1,232
Lovely fir	9,907
Red fir	18,638
Mertens hemlock	14,474
Patton hemlock	1,539
Red cedar	203

Township 4 South, Range 8 East.

This township is all drained by Salmon River. A large part of it has been burned clean, and much more has been damaged by creeping fires. The divides on either side of Salmon River afford excellent grazing for sheep. The high ridge north of the river is also a favorite huckleberry patch, which is visited annually by Indians from the Warm Springs Indian Reservation. Reforestation along the lower slopes is of an excellent character, being a dense, thrifty growth of red fir. The soil is mostly light sand and gravel of volcanic origin.

A flume down Salmon River would be required to transport this timber. The best timber is along the Mud Lake Branch, in the northeastern part of the township.

Classification of lands in T. 4. S., R. 8. E.

	Acres.
Timbered area	11,525
Burned area	8,115
Grazing area	60
Restocked area	2,355
Water surface	25

Stand of timber species in T. 4. S., R. 8. E.

	M feet B. M.
Total	273,740
White pine	2,228
Lodgepole pine	4,120
Noble fir	18,334
Lovely fir	14,319
Red fir	93,553
Mertens hemlock	125,038
Patton hemlock	6,260
Red cedar	7,888
Engelmann spruce	1,626
Tamarack	374

Forest conditions in T. 4. S., R. 8. E.

Average height, clear timber, feet	45
Average diameter, inches	21
Depth of humus, do	1⅓
Litter	Medium.
Reproduction	Light.

Township 4 South, Range 8½ East.

Nearly all of this township contains a heavy stand of timber. On the slopes of the Mud Creek Basin it is especially good. It consists mainly of red fir and Mertens hemlock, with some excellent red cedar along the creeks. The soil is sandy gravel with much rock along Salmon River.

If logs could be driven down Salmon River this timber could all be logged to that stream very cheaply, but it is questionable whether this could be done with profit.

The soil is very rocky on the steep hills, where much rock in place occurs, but along the more gentle slopes and creek bottoms the soil is deep and fertile.

It is very improbable that the timber standing in this township will ever be cut, but it could be logged to Salmon River.

Classification of lands in T. 4 S., R. 8½ E.

	Acres.
Timbered area	5,880
Burned area	35
Grazing area	85

Stand of timber species in T. 4 S., R. 8½ E.

	M feet B. M.
Total	196,071
White pine	3,522
Lodgepole pine	45
Noble fir	1,759
Lovely fir	1,230
Red fir	87,006
Mertens hemlock	85,019
Red cedar	15,596
Tamarack	341
Juniper	1,553

Forest conditions in T. 4 S., R. 8½ E.

Average height, clear timber, feet	25
Average diameter, inches	20
Depth of humus, do	1½
Litter	Medium.
Reproduction	Light.

Township 4 South, Range 9 East.

This township covers the low pass across the main divide of the Cascade Mountains where crossed by the Barlow and Oak Grove roads. It is drained on the western side by Salmon River and on the eastern side by White River and two of its important tributaries—Clear Lake and Frog Lake creeks. The timber is variable and generally of poor quality. Mertens hemlock and red fir are the prevailing species. Throughout the southern half of the township a large percentage of the timber is defective. The original forest was red fir and some of the old trees are still standing, apparently sound and clear, but all are badly decayed. A number of burns have occurred, but these are not extensive. All of this timber could be logged to the

streams mentioned, but flumes or other artificial means of transportation would be required to transport it to market.

The soil is mostly a deep gravelly sand.

Classification of lands in T. 4 S., R. 9 E.

	Acres.
Timbered area	18,855
Burned area	3,015
Grazing area	810
Water surface	360

Stand of timber species in T. 4 S., R. 9 E.

	M feet B. M.
Total	383,061
White pine	7,510
Lodgepole pine	13,840
White fir	2,356
Noble fir	25,867
Lovely fir	5,779
Red fir	170,969
Mertens hemlock	130,386
Patton hemlock	4,779
Red cedar	11,318
Engelmann spruce	812
Tamarack	9,445

Township 4 South, Range 10 East.

This township has a southern and eastern drainage through the White River, Bowlder Creek, and Gate Creek watersheds. The canyons of White River and Bowlder Creek are deep and rough, but the remaining sections have a comparatively even surface. The timber is spotted, and peculiar intermingling of timber occurs. Yellow pine, tamarack, noble fir, and Patton hemlock grow side by side as though native to the same zone. In the basins of the small streams flowing into Bowlder Creek from the west the timber is poor and fires have burned through much of it. It is mostly Mertens hemlock and red fir, with patches of red cedar along the streams. East of Bowlder Creek all the timber species are found. In this canyon there are some very fine spruce, red fir, and noble fir. Along White River bottom lodgepole pine is the prevailing tree.

Creeping fires have killed a large amount of timber throughout the township, and on the slope of White River extensive areas have been burned.

The soil is a very gravelly sand; rocky in places. All this timber could be logged to White River, but that it could be handled profitably is doubtful.

Classification of lands in T. 4 S., R. 10 E.

	Acres.
Timbered area	19,205
Burned area	3,770
Restocked area	65

Stand of timber in T. 4 S., R. 10 E.

	M feet B. M.
Total	291,177
Yellow pine	48,569
White pine	1,150
Lodgepole pine	2,689
White fir	26,894
Noble fir	18,196
Lovely fir	8,374
Red fir	137,495
Mertens hemlock	10,603
Patton hemlock	11,589
Red cedar	7,754
Engelmann spruce	7,525
Tamarack	10,253
Cottonwood	86

Forest conditions in T. 4 S., R. 10 E.

Average height, clear timber ..... feet..	28
Average diameter ..... inches..	20
Depth of humus ..... do....	¾
Litter	Medium.
Reproduction	Medium.

Township 4 South, Range 11 East.

This township is one of those added to the reserve by the proclamation of July 1, 1901. It lies mainly in the yellow-pine belt, of which species most of the timber is comprised.

Some of the land may be considered fairly good for agricultural purposes, but most of it is very rocky. Along the eastern side of the township the timber is of little value for lumber, and some narrow timberless tracts, aggregating about 200 acres, penetrate a short distance into the reserve. These are rocky depressions, upon which water stands in the spring and prevents tree growth. These sections are underlaid with hardpan, which, on the ridges, is barely covered, and much washing of the soil has taken place. This has caused the numerous ridges to be almost barren of soil, while the narrow canyon bottoms contain small tracts of fertile land deposited by this washing. In all places where the slope of this hardpan does not permit free drainage the ground during the winter and spring becomes so soft that horses and cattle are frequently lost by miring.

In the northwestern sections the brush is very dense where old burns have taken place. Logging by means of tram or skid roads would be the most practicable method. A large amount of timber has been culled from this township, but no clean

cuttings have been made. Conditions similar to these prevail throughout this range of townships.

Classification of lands in T. 4 S., R. 11 E.

	Acres.
Timbered area	22,299
Cut area	4,270
Burned area	455
Grazing area	155
Arable area	160
Cultivated area	131

Stand of timber species in T. 4 S., R. 11 E.

	M feet B. M.
Total	154,053
Yellow pine	103,662
White pine	25
White fir	8,180
Noble fir	13
Red fir	40,437
Mertens hemlock	463
Red cedar	162
Engelmann spruce	27
Tamarack	726
Incense cedar	340
Cottonwood	18

Forest conditions in T. 4 S., R. 11 E.

Depth of humus ..... inch..	½
Litter	Light.
Reproduction	Light.

Township 1 North, Range 9 East.

This township lies outside the reserve, and is drained by the West and Middle forks of Hood River, the Lake Branch, and Green Point Creek. Between the forks of Hood River is a broad, sloping ridge bearing excellent timber. Between the West Fork and the Lake Branch an old burn has grown up to a very dense growth of ceanothus and willow. From the Lake Branch to the north line of the township there is a good stand of timber everywhere except where burns have taken place. Homestead or cash entries have been filed upon nearly every quarter section.

All of this timber is tributary to the streams named, and can be logged at a reasonable expense. The land between the Middle and West forks, except the higher part of Blue Ridge, will, when cleared, be well adapted to fruit growing or other agricultural uses.

The remainder of the township is either too rough or lies at too high an elevation to be of any value for agricultural purposes.

Classification of lands in T. 1 N., R. 9 E.

	Acres.
Timbered area	19,852
Burned area	3,526
Grazing area	5
Cultivated area	35

Stand of timber species in T. 1 N., R. 9 E.

	M feet B. M.
Total	567,833
White pine	461
White fir	15,381
Noble fir	21,117
Lovely fir	6,317
Red fir	468,641
Mertens hemlock	24,136
Patton hemlock	13,065
Red cedar	18,588
Alaska cedar	127

Forest conditions in T. 1 N., R. 9 E.

Average height, clear timber ..... feet	35
Average diameter ..... inches	21
Depth of humus ..... do	1
Litter	Medium.
Reproduction	Medium.

Township 2 North, Range 9 East.

This township touches the Columbia River on the north and adjoins the Cascade Reserve on the west. The northern half breaks steeply toward the Columbia from the summit of Mount Defiance, and is cut by numerous canyons of the small streams. East and south it slopes evenly toward the Hood River Valley and Green Paint Creek. Mount Defiance is a great pile of broken rock, and much of the same formation appears on the upper slopes from it, but most of the land is a red sandy loam. Except upon the higher slopes the timber is of excellent quality. About four sections on the eastern side have been logged, and since all of the best timber land is located upon it, it is probable that it will all be cut within a few years.

This cutting is done by mills located in the timber, and the lumber is transported to the railroad by flume. Fires have swept over all of the logged area and many other tracts have been burned over.

Classification of lands in T. 2 N., R. 9 E.

	Acres.
Timbered area	19,112
Burned area	2,280
Cut area	2,110
Grazing area	160
Restocked area	46

Stand of timber species in T. 2 N., R. 9 E.

	M feet B. M.
Total	373,680
Yellow pine	940
White pine	3,695
Lodgepole pine	5,299
White fir	13,456
Noble fir	16,746
Lovely fir	11,179
Subalpine fir	954
Red fir	291,488
Mertens hemlock	13,512
Patton hemlock	5,874
Red cedar	6,225
Alaska cedar	1,280
Engelmann spruce	3,032

Forest conditions in T. 2 N., R. 9 E.

Average height, clear timber ..... feet..	43
Average diameter ..... inches..	20
Depth of humus ..... do....	1½
Litter	Medium.
Reproduction	Light.

Township 3 North, Range 9 East.

The small portion of this township lying south of the Columbia River is comprised of steep bluffs and a narrow strip of bottom land along the river, a part of which is occupied by the village of Viento.

The timber consists mainly of red fir of small size and inferior quality, with an occasional yellow pine along the foot of the hills and some cottonwood along the river bank. The undergrowth is dense vine maple, hazel, and arrowwood.

The soil is red "shot gravel" on the hills and fairly fertile black, sandy loam in the basins. Exposed basaltic rock occurs frequently along the walls. The accessible timber has been culled over for fence rails and cord wood.

Classification of lands in T. 3 N., R. 9 E.

	Acres.
Timbered area	920
Cut area	160
Grazing area	185
Cultivated area	60

Stand of timber species in T. 3 N., R. 9 E.

	M feet B. M.
Total	2,541
Yellow pine	3
Red fir	2,535
Cottonwood	3

Forest conditions in T. 3 N., R. 9 E.

Average height, clear timber	feet	25
Average diameter	inches	17
Depth of humus		Light.
Litter		Light.
Reproduction		Light.

Stand of timber in Tn. 1, 2, and 3 N., R. 9 E.

Species.	Thousand feet B. M.	Per cent of total.
Yellow pine	943	Less than 1
White pine	4,156	Less than 1
Lodgepole pine	5,299	Less than 1
White fir	28,837	3.05
Noble fir	37,863	4.01
Lovely fir	17,496	1.85
Subalpine fir	954	Less than 1
Red fir	762,664	80.78
Mertens hemlock	37,648	3.98
Patton hemlock	18,939	2.00
Red cedar	24,813	2.63
Alaska cedar	1,407	Less than 1
Engelmann spruce	3,032	Less than 1
Cottonwood	3	Less than 1
Total	944,054	100.00

Township 1 North, Range 10 East.

No detailed examination was made of this township; hence no data are given for the timber. The greater part of it is comparatively level land, well adapted to agriculture or fruit growing, and all of the areas except the hills along the eastern side and in the northwestern sections are located upon, and the work of clearing is going on as rapidly as the circumstances of the settlers will permit.

The southeastern part of the township lies on the high divide east of the East Fork of Hood River, and here much the same conditions prevail as those described in T. 1 S., R. 10 E. Creeping fires have destroyed much of the timber, and dense brush has followed. Bald Butte formerly produced excellent bunch grass which afforded pasture for the settlers' horses, but the annual visitations of sheep have almost destroyed it. North of this mountain there is a scattered growth of yellow pine and red fir along the hillside, but it is not of much value.

In the northern part of the township is a range of hills separating the upper from the lower valley. These hills at one time bore good timber, but fires have

long since destroyed nearly all of it, and in its place is a very dense growth of willow and other shrubs. The best timber is between the East and Middle forks of Hood River. It is composed mainly of red fir with some yellow pine and white fir. Fire has injured it in many places, and the litter is often very heavy. These sections contain a large amount of good saw timber, estimating 25,000 feet per acre, but many of the trees are defective from old age. A sawmill located on Hood River, in section 28, has been in operation for a number of years, supplying local demands for lumber. A logging camp has been established in section 18, and during the past year several million feet of logs have been driven down the river to the Columbia. Doubtless the greater part of this timber will be logged during the next few years. A splash dam has been built across the East Fork, in section 17, to facilitate driving. All of this timber is tributary to Hood River, and may be logged cheaply.

The soil is mostly a fertile red loam. Along the river it is a light sand and in section 11 a heavy clay loam. All of it is fertile and produces fruit of the finest quality. According to the assessment roll of Wasco County for the year 1901, there are 492 acres in cultivation in this township.

Township 2 North, Range 10 East.

With the exception of the western and southwestern parts of this township, it is a comparatively level plateau cut from southwest to northeast by the canyon of Hood River. It is all good agricultural land, and is thickly settled below the hills. Most of the timber has been cut, and the land is being cleared at a rapid rate and set to fruit trees or berries.

The soil on the north side of the river is red loam, or light sand, and on the south side mostly a heavy clay loam.

The estimated area in cultivation in the spring of 1901 was 4,230 acres, but this has been greatly increased during the year.

Township 3 North, Range 10 East.

The portion of this township lying south of the Columbia River contains 5,120 acres, which, with the exception of the break of the plateau and the overflow lands along the river, is all good agricultural land. Approximately 500 acres are under cultivation. A few tracts of scattered timber remain, but these are of little value except for cordwood.

The soil is mostly light sand, which is quite fertile when irrigated, and produces excellent fruit. The town of Hood River is in this township

CENTRAL PORTION OF CASCADE RANGE FOREST RESERVE.

By FRED G. PLUMMER.

GENERAL DESCRIPTION.

This report covers that part of the Cascade Range Forest Reserve from T. 5 S. to T. 17 S., inclusive, together with that part of the Warm Springs Indian Reservation lying west of the range line between Rs. 11 and 12 E., and also including those portions of T. 10 S., R. 10 E., and T. 11 S., Rs. 9, 10, and 11 E., not covered by the reserves. The boundaries of the region examined are as follows:

Beginning at the northwest corner of T. 5 S., R. 5 E.; thence south (subject to proper offsets) to the southwest corner of T. 17 S., R. 5 E.; thence east to the southeast corner of T. 17 S., R. 9 E.; thence north (subject to proper offsets) to the northeast corner of T. 12 S., R. 9 E.; thence east to the southeast corner of T. 11 S., R. 11 E.; thence north (subject to proper offsets) to the northeast corner of T. 5 S., R. 11 E., and thence west to the place of beginning.

The Government subdivisional surveys in this part of Oregon have been made eastward from the Willamette meridian and westward from the Deschutes meridian. As these meridians ran south from the base line, and 102 miles apart, they naturally diverged, and the excess due to this divergence falls in the area under consideration in this report. For this reason each line of townships contains a range 7½ or 8½ east, and this fractional range contains the excess mentioned. For the purpose of this report descriptions will be by township, range, or section whenever convenient, just as if the surveys had been produced over the unsurveyed areas, but it will be understood that the surveys when made will not necessarily conform to the numbering here adopted.

The tract described has a total area of 1,972,950 acres, of which 1,209,146 acres, or 61.3 per cent, lies on the western slope of the Cascade Range, and 763,804 acres, or 38.7 per cent, on the eastern slope. Both in size and in the east and west percentages this tract resembles the Mount Rainier Forest Reserve in the State of Washington, and the data contained in that report for the average latitude of 46° 30′ may properly be compared with that to be given in this report for the average latitude of 44° 40′.

All of the drainage is by tributaries of the Columbia River. From the western slope the Clackamas, Santiam, and the McKenzie rivers carry the flow to the Willamette River, and on the eastern slope the numerous small streams shown on the map (Pl. XIV) are feeders of the Deschutes River, which enters the Columbia above The

Dalles. The summit of the Cascade Range, or the line dividing this drainage, bears almost due north and south, and is an unusually straight piece. If a line be drawn from Mount Hood, which lies 14 miles north outside of the area mapped in T. 2 S., R. 9 E., to Middle Sister, in T. 16 S., R. 8 E., such a line will never be more than 4 miles from the summit. If the line be drawn from Mount Hood to the Husband, in T. 17 S., R. 7½ E., it will pass through Mount Jefferson, Mount Washington, and Belknap Crater, and will miss Olallie Butte and Three-fingered Jack by about a mile. All of the peaks mentioned are upon the true summit.

Usually in a very rough and mountainous region such as this, the mountaineer or explorer sees an ocean of ridges and peaks in which it is difficult or impossible to follow the actual summit or determine the drainage with the eye, but where, as in this case, the summit is marked by prominent peaks in so nearly a straight line the crest is plainly seen.

Twelve miles west of and parallel with the main summit is a secondary summit extending from Bachelor Mountain in T. 11 S., R. 6 E., southward through The Pyramids, Crescent Mountain, Cone Peak, Green Mountain, and ending in Lookout Mountain, in T. 16 S., R. 6 E. The area between this divide and the main summit is drained by the North Fork of the Santiam River and the McKenzie River.

From all points on the secondary divide the views are grand. On a clear day the panorama extends from Mount St. Helens, in Washington, to Diamond Peak, and includes ten snow-capped mountains with hundreds of lesser peaks. The middle ground is of lakes, meadows, cinder cones, and rivers of lava, and the foreground would be in perfect keeping with the picture if it were not too frequently an unsightly burn.

CLIMATE.

In the absence of any regular meteorological observations, the treatment of this subject is confined to the generalizing of such data as could be collected from individuals, added to the experiences and observations of my party.

A summary of the weather during the summer months as compiled from the daily memoranda is as follows:

Meteorological conditions in central part of Cascade Range Forest Reserve during summer months.

Month.	Rainy days.	Cloudy days.	Clear days.
1901.			
May	17	4	10
June	15	7	8
July	4	2	25
August	1	.....	30
September	13	.....	17
October	(a)	(a)	(a)

a More clear days than September—record not complete.

The eastern and western slopes of the Cascade Range differ widely in their general climatology, the eastern being dry with extremes of temperature while the western is wet and with a comparatively even temperature. The maximum depth of snow on the summits is about 20 feet, but this estimate does not include such areas as Mount Jefferson or the Three Sisters. The maximum depth at an elevation of 3,000 feet is 5 feet. Upon hills having an elevation of from 5,500 to 6,500 feet small patches of snow may remain as late as August 1 if well compacted and sheltered from the warm Chinook winds.

The observations on tree species, which are detailed elsewhere in this report, are germane to this subject, for the vertical range, distribution, and development of any species result from climate. The question of soil hardly enters into this problem, for the firs and pines will advance over a lava bed, or a talus slope, or cling to the face of a cliff, although such advance may be slow and the timber of poor quality. These observations locate the point at which the typical western-slope species cross the summit. Southward from the international boundary at latitude 49° the western flora "overflows" the summit of the mountains eastwardly until latitude 45° is reached, where this overflow ceases, and farther to the southward the eastern flora overflows westward. The intersection of latitude 45° with the summit of the Cascade Mountains is the "critical point" at which a line bounding the typical western-slope tree species crosses the summit. It is interesting that this point should be midway from the equator to the pole.

ROUTES OF TRAVEL.

A toll road connects the county roads of Clackamas and Wasco counties, and, crossing the mountains in latitude 45° 17′, cuts the northeast portion of the area shown on the map. It serves to connect Portland and Oregon City on the west side with Tygh Valley and Wapinitia on the east.

The Willamette Valley and Cascade Mountain toll road crosses the mountain range in latitude 44° 20′, and connects Lebanon on the west with Prineville on the east. During the summer months this road is much used by pleasure parties who visit the lakes and streams where trout abound, or trail the deer and bear. Such parties generally take camping outfits, as there is very little accommodation along the road.

The McKenzie road, formerly a toll road, but now owned by the counties of Lane and Crook, crosses the summit in the southern portion of the tract and connects Eugene on the west with Sisters and Prineville on the east. Its western end is traveled largely because of two health and pleasure resorts—Belknap Springs and Foley Springs—located in T. 16 S., R. 6 E., and reached by stage line from Eugene.

All of these roads are used by migrating families who travel eastward in the spring, and, returning in the fall, spend the winter in the Willamette Valley.

The Corvallis and Eastern Railroad is in operation from Corvallis to the town of Detroit in T. 10 S., R. 5 E., and has track laid to the shingle mill 2 miles beyond. Six miles of grade is completed eastward, and surveys have been made across the summit through Hogg Pass to a point near the toll gate in T. 14 S., R. 8 E. The grade is overgrown with alders, maples, and young conifers, except where used as a trail. After an examination of this part of Oregon it is a matter of some surprise that this railroad has not been built across the mountains, for the opportunities for advantageous development have been unusual. The lumber and fuel of the western slopes would find a ready market in the great timberless region of central Oregon, which would give in return horses, cattle, sheep and wool, and grain. Such a railroad would make easily accessible a region of unusual attractions for the sight-seer, and the summer travel by tourists would do much to convince our people that it is folly to leave their own country in search of the grandest scenery of the world.

From Detroit two trails cross the summit. One follows the Breitenbush River for 12 miles and then takes the ridges, ending at the wagon road in T. 8 S., R. 10 E. The other is locally known as the Minto trail, and follows the North Fork of the Santiam River, the Marion Fork, past Marion Lake, and thence over the summit, joining the Metoluis road near the mouth of Jacks Creek.

By using connecting trails and portions of the trails or roads mentioned above, it is possible to make the journey from Horse Pasture in T. 17 S., R. 6 E. to Mount Hood.

SOILS AND ARABLE LANDS.

Of the entire area examined, 18,550 acres, or less than 1 per cent, may be classed as arable, and of this 245 acres are in cultivation. This classification does not include the swamps, meadows, or mountain parks which by reason of their high altitude or exposed situation support only the flora native to alpine regions and are subject to frosts every month in the year. Such areas naturally take a place as grazing land and are so considered.

In the Metoluis Valley, immediately north of Black Butte, are about 15,000 acres of arable land, which, while partaking of the nature of the semiarid, is much better than that usually so classed, as it is within the timbered area and has accumulated a good top soil. Settlers have irrigated small areas for garden patches and have raised hay and grain—in all, 165 acres.

In the meadow south of Black Butte in T. 14 S., R. 9 E. there are 830 acres of good wild hay land, and it is probable that the area of arable land in this township might be increased to 5,000 acres under irrigation, but to determine this fact would require more careful surveys and estimates of waterflow than could be made in the progress of this examination.

Next in importance is the valley of the McKenzie River in T. 16 S., R. 5 E.,

where there are about 1,000 acres of good bottom land, of which 143 acres have been cultivated.

The balance of the arable and cultivated areas consists of small and unimportant tracts considered only in the aggregate.

LAVA FLOWS AND CINDER CONES.

In the region south of Mount Jefferson the evidences of recent volcanic activity are numerous. In general, it may be stated that the hills in the northern portion of the area examined are more rounded or dome-like, while to the southward the prevailing forms are those of sharp peaks and pinnacles. The peaks of Jefferson, Three-fingered Jack, Washington, and the North Sister have never been climbed by mountaineers so far as could be learned, and they certainly look inaccessible.

In the southern region six great lava streams may be recognized. One starts from a point about 4 miles southwest from Three-fingered Jack and flows westward to Lava Lake, thence southerly along the valley of the McKenzie River to the waterfalls below Clear Lake, where it is joined by another stream from the side of Belknap Crater which is located in T. 15 S., R. 7½ E.

From Belknap Crater a flood of lava poured northeasterly in a stream 3 miles wide and spread out like fingers over the southern portion of T. 14 S., R. 8 E. From the same crater a stream flowed southwesterly toward Hand Lake, and thence northwesterly down an unnamed valley for about 4 miles. Still another flow from this crater trends southerly and meets a stream from Black Crater and from fissures near the North Sister. The last-named stream from the North Sister divides and a portion flows westerly down the valley of the Whitebranch to a point near Alder Springs.

To describe these great rivers of lava by comparison with phenomena familiar to the general reader would be impossible. The first surprise to the investigator is that the edge of a flow is a wall or steep slope from 25 to 50 feet high, which must be climbed to reach the surface of the lava stream. The surface is generally much broken into angular fragments of sharp rock, although here and there may be discovered portions of a pavement-like platform which was the cooling skin of the fluid mass (see Pl. XXIII, *B*).

Both the Lebanon-Prineville and the Eugene-Prineville roads pass over lava flows, but the more southerly of the two, the Eugene-Prineville road, offers the better opportunity for study where it passes near Belknap Crater, the principal center of disturbance mentioned above.

There are six cinder cones or craters easily reached by the Lebanon-Prineville road, their location being west of the summit in T. 13 S., Rs. 7 and 7½ E. They rise from 500 to 1,500 feet above the general level of the region and are prominent objects

because of their timberless summits and dark-red color. They are formed of coarse sand and small scoria cinders with occasional croppings of lava. In sec. 16, T. 14 S., R. 8 E., the road passes close by a crater less than 100 feet in diameter into which the visitor may look without dismounting.

MINING.

It is probable that every township in the mountainous region has been visited by prospectors. At the Clackamas-Santiam divide, in T. 8 S., R. 5 E., and T. 8 S., R. 6 E., is an area of some promise, in which considerable development work has been done to open up prospects of gold and silver. In T. 8 S., R. 5 E., there are two mining camps—one in sections 29 and 30, locally known as the "Mineral Harbor Mining District," and the other in section 34, called the "Frisco Mines."

At Quartzville, in T. 12 S., R. 4 E. (outside the reserve), there was a 20-stamp mill and a large settlement, since abandoned. At the present time there are some few mining claims in T. 11 S., R. 5 E., and T. 12 S., R. 5 E., on which assessment work is being done by men who have faith in the district.

In the Blue River Basin, in T. 16 S., R. 4 E. (outside the reserve), there is a stamp mill in operation, and there has recently been some prospecting within the limits of the reserve.

MINERAL SPRINGS.

There are numerous hot springs located on the SW. ¼ of the NW. ¼ of sec. 30, T. 6 S., R. 7 E., and on the SE. ¼ of the NE. ¼ of sec. 25, T. 6 S., R. 6 E. They are distributed over an area of about 20 acres lying on both sides of the Clackamas River, and occur also in the river bed. The temperature is 188° F. Claimant has constructed a bath house, log cabin lean-to, small barn, and smokehouse, and has slashed and partly burned 6 acres and sowed timothy. Some young pear, apple, and cherry trees have been set out.

Hot sulphur spring formation covers an area of 5 acres in sec. 26, T. 7 S., R. 5 E., from which there appear to be three distinct flows. There are no improvements.

The Breitenbush Hot Springs are distributed over an area of 10 acres in sec. 20, T. 9 S., R. 7 E. Two bathing tanks have been cut out of the solid rock, one of which has been boarded in with cedar shakes. A sweat room has been built over the outlet of the main hot spring.

At Independence Prairie, in sec. 15, T. 11 S., R. 7 E., is a small mineral spring formerly known as the deer lick.

In T. 16 S., R. 6 E. are located two hot springs, which are favorite health resorts for the settlers of the Willamette Valley. In section 28 are the Foley Springs, which are reached by a side road that leaves the Eugene-Prineville road near McKenzie River bridge. Belknap Springs are in section 11, about a mile off

the main road. The temperature is 188° F. There are temporary accommodations, including bath houses at both springs. Analysis of the water of Belknap Springs gave the following results:

Analysis of water from Belknap Springs, Oreg.

Calcium sulphates	0.2386
Sodium chloride	.9250
Potassium chloride	.1318
Magnesium chloride	.0498
Calcium chloride	1.0669
Silica	.0809
Iron and aluminum oxides	.0030
Manganese chloride	Trace.
	2.5060
Oxygen set free in making chlorides	.1622
	2.6682

TIMBER.

TREE SPECIES.

The coniferous trees are as follows:

Coniferous trees in central portion of Cascade Range Forest Reserve.

Sugar pine	Pinus lambertiana.	Mertens hemlock	Tsuga mertensiana.
Yellow pine	Pinus ponderosa.	Patton hemlock	Tsuga pattoniana.
White pine	Pinus monticola.	Engelmann spruce	Picea engelmanni.
Lodgepole pine	Pinus murrayana.	Red cedar	Thuja plicata.
White-bark pine	Pinus albicaulis.	Alaska cedar	Chamæcyparis nootkatensis.
Noble fir	Abies nobilis.		
Lovely fir	Abies amabilis.	Tamarack	Larix occidentalis.
White fir	Abies grandis.	Incense cedar	Libroccdrus decurrens.
Subalpine fir	Abies lasiocarpa.	Yew	Taxus brevifolia.
Red fir	Pseudotsuga taxifolia.		

With the exceptions of sugar pine and incense cedar, the above-named species are the same as those which form the forests of the Cascade Mountains in the State of Washington. These two species have their northern limit in the area under consideration in this report.

GEOGRAPHICAL DISTRIBUTION OF TIMBER SPECIES.

SUGAR PINE (PINUS LAMBERTIANA).

At this latitude the sugar pine is found west of the summit of the Cascade Range in a limited strip extending from the southwest slope of Scorpion Mountain in a southwesterly direction toward Chimney Peak. Its northern limit will be in the

lower watershed of Humbug Creek in T. 9 S., R. 6 E., and in latitude 44° 47′, longitude 122° 04′. The trees are not at their best growth and will average 3 feet in diameter and 140 feet high, with 50 feet of clear trunk.

YELLOW PINE (PINUS PONDEROSA).

In this portion of the Cascade Mountains the yellow pine is an eastern slope tree and its distribution is shown on Pl. XV. At about latitude 44° 25′ it overflows the summit westerly about 6 miles, and mature trees are found near Sand Mountain. The true point where this species crosses the summit must be placed farther south in the area examined by Messrs. Dodwell and Rixon in latitude 43° 30′, from which point it extends, with few breaks, to and beyond the city of Albany, Oreg. Bordering the timberless area of eastern Oregon it forms a forest of pure growth and is the pioneer in the reclamation of the desert lands, but is assisted by the white fir, tamarack, and red fir, in the order named. Its forests are generally open, without much litter or undergrowth, and for these reasons are almost immune from fire. The mature trees average 2.5 feet in diameter and 120 feet high, with clean, straight trunks, 30 feet to the first limbs.

WHITE PINE (PINUS MONTICOLA).

The white pine is distributed over the entire western slope north of the McKenzie River, and also covers a portion of the eastern slope in the watershed of White River and at the headwaters of Warm Springs River and Beaver Creek. It averages less than 1 per cent of the mixed forests, and therefore can not take the commercial rank to which its excellent qualities entitle it. The mature trees average 2 feet in diameter and 100 feet in height, with a clear trunk of 35 feet.

LODGEPOLE PINE (PINUS MURRAYANA).

This species is found on both slopes of the mountains, and seems to thrive under all the conditions of climate and exposure that this varied region presents. The tree is of little or no value commercially, but is an important pioneer, restocker, and snow protector in the high altitudes. It reaches its best development south of latitude 44° 15′, where it often forms three-fourths of the forest in the most unpromising areas. In the high sandy flats the trees are of slow growth and stunted in height, but under better conditions the mature trees will average 1 foot in diameter and 50 feet high, with small limbs almost to the ground.

WHITE-BARK PINE (PINUS ALBICAULIS).

The white-bark pine is confined to the high peaks and ridges, where, as throughout the whole Cascade Range, it is the timber-line tree. Although it attains a diameter of 2 feet at the butt, the trunk is so limby and twisted as to

be of little value even if it were accessible. In sheltered spots a tree may stand 40 feet high, and on high storm-swept ridges may lie flat on the ground or crouched behind a large bowlder.

NOBLE FIR (ABIES NOBILIS).

This is an important tree in the mixed forests of the middle altitudinal zone of the western slope, where it frequently comprises 15 or 20 per cent of the forest. It crosses the summit in latitude 45°, where favorable climatic conditions, due to the proximity of the Columbia River Gap, have made its advance possible. It can not compete with the yellow pine and tamarack in the dry areas where these trees flourish. It is closely associated with the lovely fir, and among lumbermen both species are improperly called larch. The tree has a remarkably straight and clear trunk, averaging 70 feet, or one-half its height, to the first limbs, and with a diameter at the base of 4 feet. In T. 11 S., R. 5 E. this species reaches an unusual state of development, some individuals being 8 feet in diameter.

LOVELY FIR (ABIES AMABILIS).

The lovely fir is found over the western slopes, and assists in the timbering of some of the high areas east of the summit. Its altitudinal range is not so great as that of the noble fir, but its distribution is greater and it generally forms a larger percentage of the forest. The mature trees are about 3 feet in diameter and 120 feet high, with 35 feet of clear trunk.

WHITE FIR (ABIES GRANDIS).

This species has a wider and more general distribution over this portion of the Cascade Mountains than any other tree. Only in two townships does it comprise more than 15 per cent of the forest, yet the average for the entire area examined is nearly 4 per cent. A sentiment exists against the wood, which, although only half deserved, always operates excepting where more desirable timber is not to be had. The average diameter of mature trees is 3.5 feet with a height of 140 feet, of which 40 feet is clear trunk.

SUBALPINE FIR (ABIES LASIOCARPA).

The subalpine fir, being native to the higher zones, is generally inaccessible and of little value commercially. The tree is all crown, very symmetrical and with thick foliage. It develops equally well on either side of the summit, requiring only the altitude which prevents competition from larger species which would overshade it. Under favorable conditions a mature tree will reach a height of 60 feet.

RED FIR (PSEUDOTSUGA TAXIFOLIA).

This species takes the lead among the timber trees for quantity and accessibility, as well as for the desirable properties of the wood for building and general con-

struction work. Its distribution is shown on Pl. XV. It is a western-slope tree up to latitude 45°, where it crosses the summit and timbers both slopes as far northward as the international boundary at 49° and beyond.

The yellow fir is the giant of these forests and attains a diameter of 10 feet, with 125 feet of clear trunk, but a fair average of the mature trees would be 6 feet diameter, with 200 feet height and 90 feet of clear trunk. Only about 10 per cent of the species is of the yellow variety, and the red variety is a smaller tree, being on the average 4 feet in diameter, with a height of 175 feet and 70 feet of clear trunk.

MERTENS HEMLOCK (TSUGA MERTENSIANA).

The Mertens hemlock is distributed over the western slope and crosses the summit eastward with the red fir in latitude 45°, as shown on Pl. XV. It ranks second in quantity, forming over 10 per cent of the entire timber stand examined, but such desirable qualities as it possesses are yet to be recognized by millmen and consumers. Mature trees are tall and slender with scanty foliage, and have an average diameter of 2.5 feet and height of 125 feet, of which 50 feet is clear trunk.

PATTON HEMLOCK (TSUGA PATTONIANA).

This species is a close companion of the subalpine fir on the higher elevations of both slopes, where it is a beautiful and ornamental tree, with graceful foliage from apex to base. In the mixed forests of the lower slopes it will average 2 feet in diameter and 80 feet high, with 15 feet of clear trunk.

ENGELMANN SPRUCE (PICEA ENGELMANNI).

The Engelmann spruce has a limited distribution in the area under consideration, although the species is common to more northern and more southern latitudes. If a line be drawn from Crater Lake, in T. 5 S., R. 8½ E., to Browder Ridge, in T. 14 S., R. 6 E., it will give the general direction of a belt from 10 to 20 miles in width in which this species is found. Mature trees will average 2.5 feet in diameter and 100 feet high, with 25 feet of clear trunk.

RED CEDAR (THUJA PLICATA.)

The red cedar is a moisture-loving tree of the valleys and low benches of the western slope, where it is generally associated with the red fir, hemlock, and white fir. It is the wood most prized among the settlers, as it splits easily into boards or fence rails. The mature trees always have swell butts and taper rapidly. Measured breast high they will average 5 feet in diameter, with a total height of 100 feet, of which 30 feet is clear trunk. Its distribution is more particularly shown on Pl. XV, which also shows that it crosses the summit in latitude 45° with other species above mentioned.

ALASKA CEDAR (CHAMÆCYPARIS NOOTKATENSIS.)

This species is more common to northern latitudes, which reaches its southern limit in sec. 8, T. 14 S., R. 6 E., at the headwaters of Deer Creek, a tributary of the McKenzie River. Representatives of this tree were found in fourteen townships, but only in T. 8 S., R. 6 E., were the trees of sufficient size or number to be included in the estimates. Mature trees are 1.5 feet in diameter and 45 feet high, with 12 feet of clear trunk.

TAMARACK (LARIX OCCIDENTALIS).

The tamarack is found in two areas. From the valley of the Metoluis River, in T. 12 S., R. 9 E., southward to the valley of Squaw Creek, in T. 16 S., R. 9 E., is a belt which places the southern limit of this tree at least as far south as latitude 44° 08′. Another area of about 75,000 acres surrounds Tamarack Mountain in T. 6 S., R. 9 E. The trees average 2.5 feet in diameter and 100 feet high, with 35 feet of clear trunk.

INCENSE CEDAR (LIBROCEDRUS DECURRENS).

This species has its northern limit in latitude 44° 50′, and it was found in twenty-one townships on both sides of the summit. Mature trees have a diameter of 2.5 feet and a height of 100 feet, with 25 feet of clear trunk.

YEW (TAXUS BREVIFOLIA).

This tree is common on the moist hillsides and benches of the western slopes. It does not reach merchantable size.

RANGE AND DEVELOPMENT OF TREE SPECIES.

The altitudinal range of all the conifers is shown on Pl. XVI, the elevations being given above sea level. The form for each species is intended by its width to show the relative development of that species for any given altitude. The diagram is prepared from observations made at 670 different stations, ranging in elevation from 1,000 to 8,500 feet above the sea, and shows the conditions existing for average latitude 44° 40′.

By comparison with similar diagrams made by me for latitudes 46° 30′ and 47° 30′ it would appear that: (1) White-bark pine, noble fir, subalpine fir, Mertens hemlock, Patton hemlock, and red cedar reach higher altitudes with the decrease in latitude; (2) yellow pine, lovely fir, white fir, red fir, Engelmann spruce, Alaska cedar, and tamarack reach lower altitudes with the decrease in latitude; (3) white pine and lodgepole pine have practically the same upper altitudinal limit for the three latitudes named.

These facts will be useful for future comparison, but should not be given too great significance as they stand, for the reason that the Cascade Mountains, in which all the observations were made, present a wide diversity of climate and exposure,

and for the further reason that so many of the summits are burned, which, were the timber standing, might change the figures.

The altitudes at which the various species attain their best development, when compared for the different latitudes, offer a more rational means of determination, inasmuch as these altitudes are more protected from the extremes of climate. On this basis none of the species show a decrease of altitude when latitude 44° 40′ is compared with latitude 47° 30,′ but all save four reach higher altitudes with the decrease of latitude. The four exceptions are white pine, white fir, Mertens hemlock, and tamarack, all of which have the same altitudes for the three latitudes named.

RATE OF GROWTH OF CONIFERS.

The average annual rate of growth of the conifers, as determined by the measurement of 25,983 annual rings, was 0.0689 inch. This means that the crop or increase for the average tree examined is a growth of 0.0689 inch per year on the radius, measured breast high above the ground. Trees were not cut for this purpose of measurement, but clearing and roadmaking furnished stumps which were used when their condition permitted the rings to be counted.

DEFECTS.

The incense cedar is almost always hollow trunked or dry rotted at the heart, even though the tree may have every outward appearance of perfect health. The wood has been little used for any purpose except fuel or fencing, and is not cut when any better is obtainable.

White pines are afflicted by some disease which causes the bark to strip and fall and results in the death of the tree. Repeated examinations failed to discover any beetle or worm that might be the cause. In T. 10 S., R. 7 E., about 25 per cent of the white pines are thus defective.

Hemlocks are liable to wind shake when exposed, and in the mixed forests are sometimes killed by the overshading of the firs.

The red fir can be strong and vigorous at the age of 500 years, but in such a period of time the chances of death by fire are great, and a real "old growth" or primeval forest of large trees is a rare sight, and impressive as well. A few such areas exist in the vicinity of Detroit and in sec. 36, T. 11 S., R. 7 E., where there has been no damage by fire and where there are few trees dead from old age.

ESTIMATES.

Area of region examined.

	Acres.
Cascade Range Forest Reserve	1,500,343
Warm Springs Indian Reservation	438,705
Other lands (south of the Metolius River)	33,902
Total	1,972,950
East of Cascade Range	763,804
West of Cascade Range	1,209,146

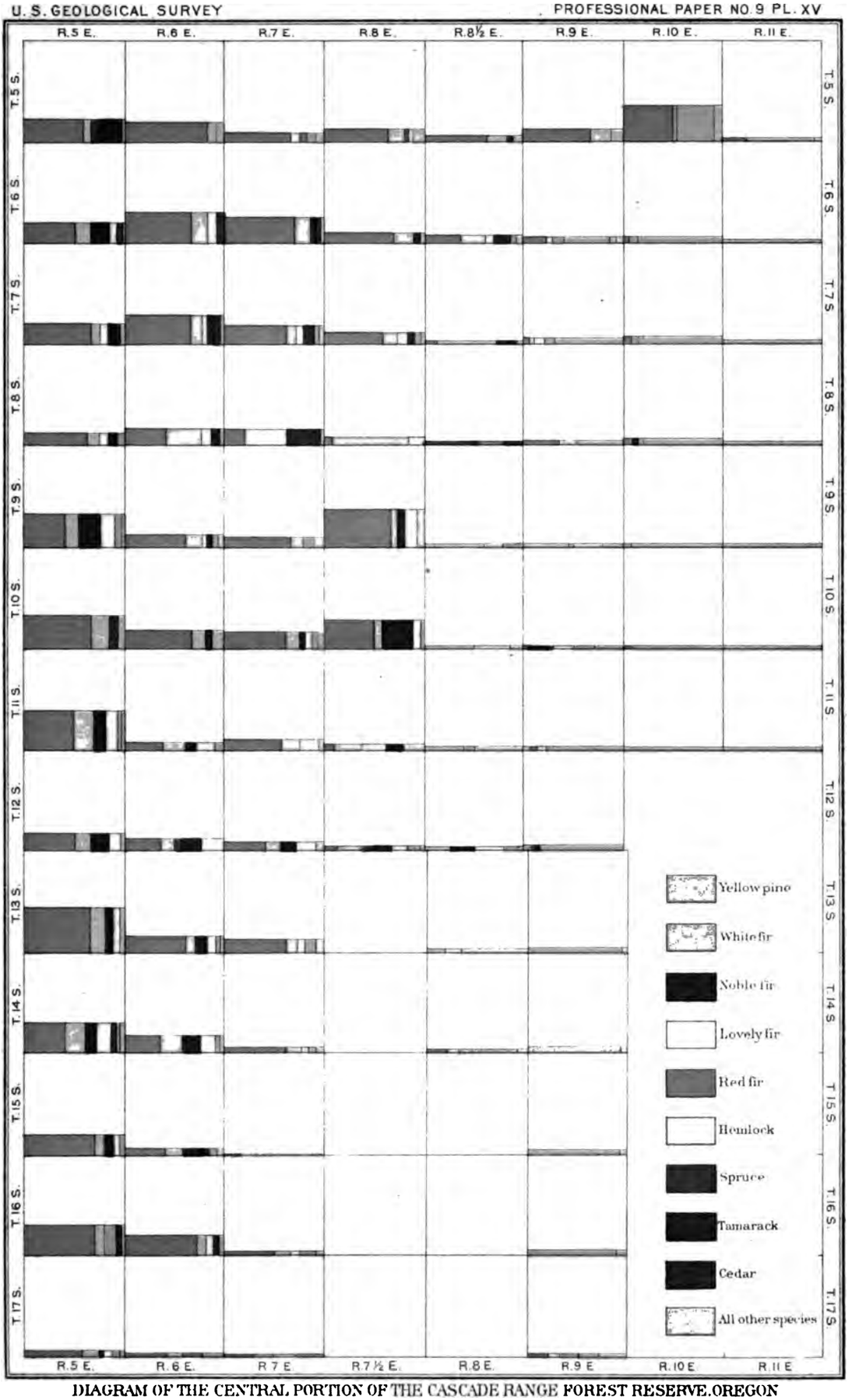


DIAGRAM OF THE CENTRAL PORTION OF THE CASCADE RANGE FOREST RESERVE, OREGON

showing stand and commercial species of timber

Vertical scale of stand

billion feet B M.

JULIUS BIEN & CO LITH N Y

Classification of lands shown on Pl. XIV.

	Acres.
Timbered area	1,684,550
Burned area	174,680
Logged area	2,220
Lakes	5,600
Swamps	6,390
Cinder cones	1,330
Glaciers, snow, or areas above timber line	24,740
Arid or semiarid in eastern Oregon	73,440
Total	1,972,950

Subdivision of total area shown on Pl. XIV, by counties.

	Acres.
Clackamas County	347,296
Marion County	196,898
Linn County	443,778
Lane County	221,174
Wasco County	278,197
Crook County	485,607
Total	1,972,950

Estimates of timber in area examined.

	Feet B. M.
Cascade Range Forest Reserve	9,668,146,500
Warm Springs Indian Reservation	754,810,000
Other lands (south of Metoluis River)	27,731,000
Total	10,450,687,500
East of Cascade Range	1,524,395,000
West of Cascade Range	8,926,292,500

Density of timber in the total area examined.

Density.	Area.	Estimated stand
Feet B. M. per acre.	*Acres.*	*Feet B. M.*
0 to 2,000	778,593	667,567,000
2 to 5,000	382,723	1,339,530,500
5 to 10,000	199,022	1,492,665,000
10 to 25,000	263,670	4,614,225,000
25 to 50,000	58,772	2,203,950,000
50 to 100,000	1,770	132,750,000
Total	1,684,550	10,450,687,500

Stand of timber, by counties, in area examined.

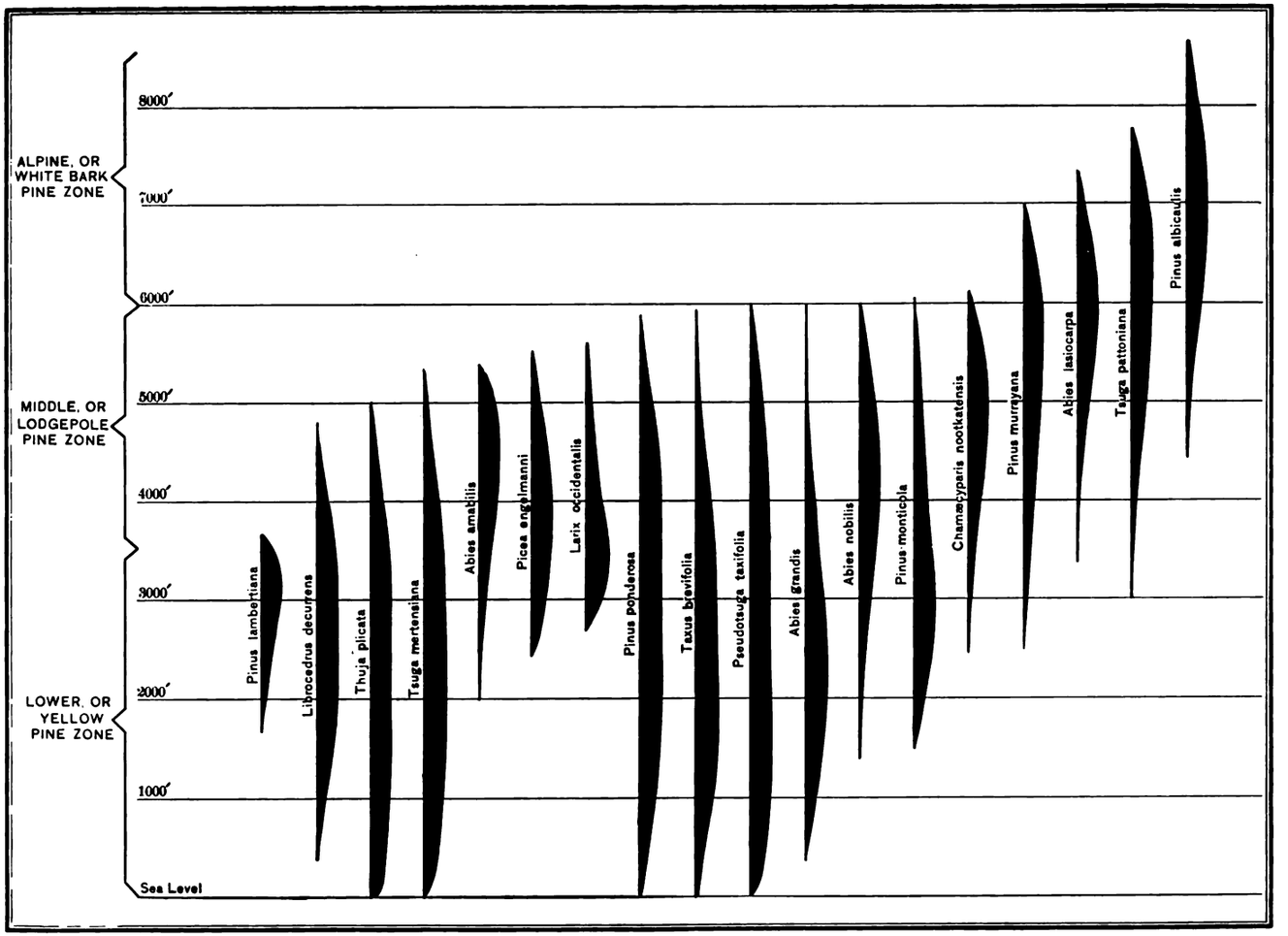
	Feet B. M.
Clackamas County	3,722,916,500
Marion County	1,460,577,000
Linn County	2,987,652,500
Lane County	845,146,500
Wasco County	854,586,000
Crook County	669,809,000
Total	10,450,687,500

Average stand of timber per acre in feet B. M.

Entire area examined	5,297
Timbered area	6,204
East of Cascade Range	1,996
West of Cascade Range	7,382
Cascade Range Forest Reserve	6,444
Warm Springs Indian Reservation	1,720
Clackamas County	10,749
Marion County	7,417
Linn County	6,507
Lane County	3,821
Wasco County	3,072
Crook County	1,379

Proportion and amount of timber species for the entire area examined.

Species.	Percentage of the total forest.	Amount in feet B. M.
Red fir	50.973	5,326,987,105
Mertens hemlock	10.113	1,056,925,495
Yellow pine	9.033	944,049,945
Lovely fir	8.230	860,132,670
Noble fir	7.048	736,603,200
Patton hemlock	3.954	413,193,745
White fir	3.804	397,540,080
Red cedar	2.578	269,392,960
Subalpine fir	1.377	143,862,230
White pine	.991	103,584,885
Lodgepole pine	.674	70,477,320
Engelmann spruce	.501	52,382,805
Incense cedar	.324	33,821,150
Tamarack	.317	33,142,000
Alaska cedar	.044	4,567,100
Sugar pine	.039	4,024,810
White-bark pine (represented)		
Yew (represented)		
Total	100.000	10,450,687,500



RANGE AND DEVELOPMENT OF TIMBER-TREE SPECIES IN THE CENTRAL PORTION OF THE CASCADE RANGE RESERVE.

Density and stand of timber in area examined, by townships.

Township.	Range.	0 to 2,000 feet.	2,000 to 5,000 feet.	5,000 to 10,000 feet.	10,000 to 25,000 feet.	25,000 to 50,000 feet.	50,000 to 100,000 feet.	Total timber area.	Estimated stand.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Feet B. M.*
5	5	.....	.....	6,775	16,158	.....	.....	22,933	333,577,500
	6	.....	3,400	6,265	9,970	1,147	.....	20,782	276,375,000
	7	1,650	11,330	1,705	2,835	120	.....	17,640	108,205,000
	8	1,310	8,550	3,200	6,920	830	.....	20,810	207,460,000
	8½	.....	520	3,240	790	430	.....	4,980	56,070,000
	9	.....	5,579	9,160	2,520	720	.....	17,979	159,326,500
	10	360	1,700	13,620	5,040	1,750	.....	22,470	262,285,000
	11	14,555	.....	3,350	240	.....	.....	18,145	43,880,000
6	5	.....	1,970	7,100	9,790	1,430	.....	20,290	285,095,000
	6	.....	.....	3,680	13,787	5,130	.....	22,597	461,247,500
	7	.....	833	5,680	13,880	1,920	.....	22,313	360,415,500
	8	2,889	14,400	1,750	2,510	.....	.....	21,549	110,339,000
	8½	1,130	1,170	870	2,780	.....	.....	5,950	60,400,000
	9	4,770	15,703	160	130	.....	.....	20,763	63,205,500
	10	.....	21,970	.....	.....	.....	.....	21,970	76,895,000
	11	20,726	.....	.....	.....	.....	.....	20,726	20,726,000
7	5	.....	1,500	8,777	10,750	1,175	.....	22,202	303,265,000
	6	.....	1,746	290	18,060	2,370	.....	22,466	413,211,000
	7	.....	.....	9,170	11,000	.....	.....	20,170	261,275,000
	8	11,280	4,300	400	5,890	.....	.....	21,870	132,405,000
	8½	3,530	1,290	.....	500	.....	.....	5,320	16,795,000
	9	8,946	14,430	.....	.....	.....	.....	23,376	59,451,000
	10	.....	21,275	.....	.....	.....	.....	21,275	74,462,500
	11	10,116	.....	.....	.....	.....	.....	10,116	10,116,000
8	5	770	15,320	1,590	3,970	880	.....	22,530	168,790,000
	6	1,070	13,560	550	7,490	1,190	.....	23,860	228,355,000
	7	1,380	1,490	14,550	7,330	.....	.....	24,750	243,995,000
	8	11,510	6,380	3,430	2,470	.....	.....	23,790	102,790,000
	8½	5,620	.....	.....	120	.....	.....	5,740	7,720,000
	9	16,820	3,010	.....	.....	.....	.....	19,830	27,355,000
	10	5,276	16,020	.....	.....	.....	.....	21,296	61,346,000
	11	2,305	.....	.....	.....	.....	.....	2,305	2,305,000
9	5	68	7,200	4,020	6,950	1,910	.....	20,048	244,918,000
	6	99	10,600	1,280	1,940	2,250	.....	16,169	165,124,000
	7	5,920	950	8,700	4,260	.....	.....	19,830	149,045,000
	8	18,650	.....	90	580	.....	.....	19,320	29,475,000
	8½	7,190	.....	.....	.....	.....	.....	7,190	7,190,000
	9	19,760	1,610	.....	.....	.....	.....	21,370	25,395,000
	10	9,750	10,830	.....	.....	.....	.....	20,580	47,655,000
	11	11,862	.....	.....	.....	.....	.....	11,862	11,862,000

Density and stand of timber in area examined, by townships—Continued.

Township.	Range.	0 to 2,000 feet.	2,000 to 5,000 feet.	5,000 to 10,000 feet.	10,000 to 25,000 feet.	25,000 to 50,000 feet.	50,000 to 100,000 feet.	Total timber area.	Estimated stand.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Feet B. M.*
10	5	188	1,000	2,380	13,600	3,080	710	20,958	428,288,000
	6	307	10,350	3,310	7,700	1,100	.....	22,767	237,357,000
	7	1,047	5,210	5,850	4,860	1,950	.....	18,917	221,332,000
	8	7,590	.....	1,280	500	320	.....	9,690	37,940,000
	8½	7,990	.....	.....	.....	.....	.....	7,990	7,990,000
	9	19,090	.....	.....	.....	.....	.....	19,090	19,090,000
	10	23,009	.....	.....	.....	.....	.....	23,009	23,009,000
	11	16,154	.....	.....	.....	.....	.....	16,154	16,154,000
11	5	1,380	3,200	6,130	9,700	2,370	.....	22,780	317,180,000
	6	2,664	6,590	3,400	2,440	.....	.....	15,094	93,929,000
	7	10,214	.....	3,480	4,740	440	190	19,064	150,014,000
	8	14,730	620	480	.....	.....	250	16,080	39,250,000
	8½	10,850	.....	.....	.....	.....	.....	10,850	10,850,000
	9	19,355	.....	.....	.....	.....	.....	19,355	19,355,000
	10	20,640	.....	.....	.....	.....	.....	20,640	20,640,000
	11	11,170	.....	.....	.....	.....	.....	11,170	11,170,000
12	5	8,293	770	3,200	9,130	1,290	.....	22,683	243,138,000
	6	7,978	4,920	6,480	1,100	1,430	.....	21,908	146,673,000
	7	12,150	480	8,000	1,090	.....	.....	21,720	92,905,000
	8	12,330	4,850	.....	.....	.....	.....	17,180	29,305,000
	8½	14,400	.....	.....	.....	.....	.....	14,400	14,400,000
	9	8,658	14,470	.....	.....	.....	.....	23,128	59,303,000
13	5	.....	2,953	5,620	4,600	6,500	260	19,933	396,235,500
	6	2,982	950	5,680	4,430	3,130	.....	17,172	243,807,000
	7	14,510	700	2,470	620	2,770	.....	21,070	150,210,000
	7½	7,380	.....	.....	.....	.....	.....	7,380	2,000,000
	8	14,181	990	950	.....	.....	.....	16,121	24,771,000
	9	9,162	12,930	.....	.....	.....	.....	22,092	54,417,000
14	5	.....	6,774	2,860	1,490	3,190	360	14,674	217,859,000
	6	9,721	4,830	1,080	5,470	.....	.....	21,101	130,451,000
	7	15,538	3,580	1,220	320	500	.....	21,158	50,030,000
	7½	9,120	.....	.....	.....	.....	.....	9,120	2,000,000
	8	14,701	6,010	690	.....	.....	.....	21,401	40,911,000
	9	2,515	19,600	.....	.....	.....	.....	22,115	71,115,000
15	5	8,210	7,490	4,460	4,760	.....	.....	24,920	151,175,000
	6	17,620	1,050	5,490	700	550	.....	25,410	95,345,000
	7	24,440	.....	370	.....	.....	.....	24,810	8,775,000
	7½	13,430	.....	.....	.....	.....	.....	13,430	3,000,000
	8	19,830	.....	.....	.....	.....	.....	19,830	4,000,000
	9	6,058	16,920	.....	.....	.....	.....	22,978	65,278,000

Density and stand of timber in area examined, by townships—Continued.

Township.	Range.	0 to 2,000 feet.	2,000 to 5,000 feet.	5,000 to 10,000 feet.	10,000 to 25,000 feet.	25,000 to 50,000 feet.	50,000 to 100,000 feet.	Total timber area.	Estimated stand.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Feet B. M.*
16	5	12,410	.....	480	6,400	2,400	.....	21,600	218,010,000
	6	8,640	1,610	2,000	5,810	4,600	.....	22,660	303,450,000
	7	16,424	.....	1,530	780	.....	.....	18,734	41,549,000
	7½	15,480	.....	.....	.....	.....	.....	15,480	4,000,000
	8	13,518	.....	.....	.....	.....	.....	13,518	3,000,000
	9	2,158	18,900	.....	.....	.....	.....	21,058	68,308,000
17	5	12,140	450	730	4,410	.....	.....	17,730	96,365,000
	6	16,210	1,670	.....	360	.....	.....	18,240	28,355,000
	7	18,370	.....	.....	.....	.....	.....	18,370	18,370,000
	7½	11,620	.....	.....	.....	.....	.....	11,620	3,000,000
	8	14,670	.....	.....	.....	.....	.....	14,670	3,000,000
	9	18,056	4,220	.....	.....	.....	.....	22,276	32,826,000
Total.....		778,593	382,723	199,022	263,670	58,772	1,770	1,684,550	10,450,687,500

UNDERBRUSH.

Wherever there is a dense growth of young conifers, either in the forest or in the restocking of a burn or clearing, such growth is commonly known among woodsmen as a "thicket," and the term underbrush is generally applied to the deciduous trees and shrubs.

In the yellow-pine region bordering the timberless area of eastern Oregon the forest floor is often as clean as if it had been cleared, and one may ride or even drive without hindrance. As the hills are approached the brush increases, with this general exception, that from Three-fingered Jack to the Three Sisters the summits are wide and the surface is largely loose or drifting sand bordering or covering lava flows, and in this area the brush is light.

On the northern summits and on all the western slopes the underbrush is heavy, and together with the litter makes travel off the trails impossible with pack animals.

Deciduous trees in central portion of Cascade Range Forest Reserve.

Cottonwood	Populus trichocarpa.
Vine maple	Acer circinatum.
Red alder	Alnus oregona.
Longleaf willow	Salix fluviatilis.
Chinquapin	Castanopsis chrysophylla minor.

Smaller trees and shrubs in central portion of Cascade Range Forest Reserve.

Sweet myrtle	Ceanothus velutinus.
Dogwood	Cornus nuttallii.
Hazel	Corylus rostrata.
Oregon grape	Berberis aquafolium.
Salal	Gaultheria shallon.
Devils club	Echinopax horridum.
Manzanita	Arctostaphylos patula.
Huckleberry	Vaccinium ovatum.
Blackberry	Rubus ursinus.
Rhododendron	Rhododendron californicum.

The forage grasses and weeds are listed and described by Frederick V. Coville in Bulletin No. 15, Department of Agriculture, Division of Forestry.

BURNS.

The total area of all the burns is 174,680 acres, which is 10.31 per cent of the timbered area. Probably 90 per cent of the entire area examined has at some remote period suffered from fires, of which traces still remain.

The areas here classified as burns are those on which the fires are of comparatively recent occurrence and on which the restocking has not reached a size which can be called merchantable as timber. Diligent inquiry was made to fix the dates and causes of the fires, an undertaking beset with difficulty, for those persons who have the most reliable information are the ones involved in the cause, and they therefore have the best of reasons for a strict silence.

A burn south of the Clackamas River, in T. 6 S., R. 7 E., happened in the year 1897, and is reported due to the fire getting away from a settler's slashing. On the southwest side of Scorpion Mountain, in T. 9 S., R. 6 E., a fire occurred in 1893. Secs. 5 and 8, T. 9 S., R. 7 E., were burned in 1895. The southeast side of Scorpion Mountain, in T. 9 S., R. 7 E., was burned in 1880 and again in 1893. The burn in secs. 24 and 25, T. 9 S., R. 7 E., and extending eastward occurred before the year 1850. The big burn, in T. 10 S., Rs. 7 and 8 E., first occurred about one hundred years ago, but portions were reburned during the Indian war in 1856 and later. The last extensive burning of the restocking was in 1895. The large burn in T. 11 S., R. 6 E., is the result of several fires, the last of which was in 1892. The northeast part of T. 11 S., R. 7 E., was burned in 1870, and in the southeast portion of the same township a fire occurred in 1896. This township is a good place to study ancient and recent burns in all stages of restocking. The evidence is strong that a fine forest once covered this region and that all now remaining is in the area where the stand is between 25,000 and 100,000 feet B. M. per acre. The sizes and locations of the existing dead snags and stumps, all burned, indicate that several fires swept the region. The area where the stand is less than 2,000 feet B. M. per acre was burned more than fifty years ago, but portions of that burn were reburned in 1870. The area in T. 12

S., R. 7 E., where the stand is less than 2,000 feet B. M. per acre, is the restocking of a burn which occurred over ninety years ago. The big burn west of Marion Lake is the result of several fires, the last of which occurred in 1894. The burn in T. 13 S., Rs. 5 and 6 E., occurred in 1867 and was very severe. Several smaller fires have since destroyed the restocking, one in 1896 being the most destructive. The restocking is mainly red fir. In T. 14 S., R. 5 E., the burn in sections 1, 2, 3, and 4 occurred in 1885 and again in 1897. Section 12 and a part of 13 was burned in 1896. That in 13 and 24 is very old.

In many burned areas fire-killed trees remain standing as "snags" when the flames were not severe enough to consume them, but such snags are not estimated as timber. The wood of a fire-killed conifer is hard, often glassy and extremely brittle, and has the property of resisting decay from moisture, and is therefore desirable for fence posts or foundation blocks. But besides being very dirty handling, the snags are hard chopping or sawing and are likely to break in felling. Recently published specifications of the Western Union Telegraph Company for 8,690 telegraph poles recite that "fire-killed timber will not be accepted."

HUMUS.

All of the naturally forested area is carpeted with humus varying in depth from an inch or two in the pine forests to 20 inches in the red fir "old growths." Seldom have fires been so severe as to entirely destroy this covering, and therefore the restocking has been rapid.

LITTER.

The litter is the graveyard of the forest, and as such is a constant menace to the living trees. It is composed of the fallen limbs of living trees and the trunks and limbs of the dead ones lying as they fell upon the forest floor. In the late summer or fall the Western forest is a potential conflagration, with the humus for tinder, the litter for kindling, and the standing forest for the fuel. All that is needed is the match and the wind.

The litter is at its minimum in the most easterly of the yellow-pine areas, where there is only here and there a tree fallen from old age. On the high exposed summits it is composed of broken limbs and saplings whose root hold was not secure against the storms or weight of snow. In the thick forests of the western slopes it is generally composed of immature trees killed by overshading or windshake, and it covers the floor to a depth of 5 or 6 feet. On one occasion, after making a circuit of a section of country in the Clackamas watershed and using trails for the transfer of the camp equipage, it was decided to save time by making a short cut for the base of supplies, which was 8 miles distant. It took three days to get the pack animals through. Such litter, with the addition of a sapling growth thicket and some thorn-

covered Devil's club (*Echinopax horridum*), is very properly termed heavy, and if one has to go through such an area the travel is slow.

TIMBERLESS AREAS.

Under this heading are included lakes, swamps, cinder cones, areas above timber limit either with or without snow fields or glaciers, and the arid or semiarid lands east of the yellow-pine limit. They aggregate 111,500 acres, or 5.65 per cent of the total area examined, and are therefore a material factor in the preparation of the data shown on the tables included in this report.

The most extensive snow fields are at the Three Sisters. Probably an exceptionally warm summer would leave no snow on Mount Washington or on Three-fingered Jack, and would divest Mount Jefferson of all but the most compact and protected fields. As late as May these peaks are shrouded in white, but by September they present a very different appearance. Two glaciers on Mount Jefferson and three on the Sisters were seen, sketched, and photographed, but were not examined. They are insignificant as compared with those upon Mount Rainier or Mount Hood. Streams issuing from these glaciers are appropriately called Whitewater, Whitebranch, and Soap Creek, for glacial water is invariably of a milky color.

CUTTING.

The total of all the areas logged or cleared amounts to 2,220 acres, or less than 0.1 per cent of the timbered area.

In secs. 7, 8, and 17, T. 5 S., R. 10 E., the best timber has been cut from 80 acres and a good forest cover left standing. The timber is yellow pine and red fir. It was sawed at the mill located on Clear Creek in section 8. This mill was built in 1885 and is only run when lumber is needed for local use of settlers in the vicinity of Wapinitia, 20 miles eastward. In sec. 22, T. 5 S., R. 10 E., a mill was built, but was never run, and, excepting the boilers and engines, has been destroyed. A sawmill in sec. 15, T. 10 S., R. 5 E., had a capacity of 25,000 feet B. M. daily. It only ran a year and a half, and then not to its full capacity. A sawmill in sec. 16, T. 10 S., R. 5 E., ran from 1896 to 1900. It had a capacity of 30,000 feet B. M. daily. In sec. 12, T. 10 S., R. 5 E., a sawmill had a capacity of 30,000 feet B. M. daily; it was running from 1896 to 1900. The logging along the Breitenbush River is for the rail shipment of logs to Mill City. The east half of sec. 16 and the west half of the SE. ¼ of sec. 3, T. 13 S., R. 9 E., have been cleared. A shingle mill with a capacity of 25,000 shingles daily, located in sec. 18, T. 10 S., R. 6 E., has culled cedar from about 100 acres. In sec. 23, T. 8 S., R. 10 E., is a mill run by Indians to supply lumber to the Warm Springs Agency when needed. Some of the best timber has been culled from the neighboring forest. In and near sec. 18, T. 16 S., R. 5 E., about 200,000 feet has been culled for the local use of settlers; it was cut by a portable mill.

LOGGING CONDITIONS.

The watersheds lying west of the summit of the Cascade Mountains are sharply defined by high divides which trend westerly for 25 or 30 miles beyond the boundary of the forest reserve, and terminate in low hills bordering the wide and fertile valley of the Willamette River. The timber of these watersheds is naturally tributary to the commercial centers in the valley as follows: Clackamas watershed is tributary to Portland, North Fork of the Santiam watershed is tributary to Salem or Albany, South Fork of the Santiam watershed is tributary to Albany, McKenzie watershed is tributary to Eugene.

With the present methods of logging and milling, it is probable that all operations will be carried on in or near the mountains close to the supply and where water power is abundant. In this case the finished product will be billed to destination or shipped to the valley towns for market distribution. In any event the results will depend largely upon railroad development, and it is among the possibilities that much of the lumber will find a market in eastern Oregon when a trans-mountain railroad is built.

PRICES.

Prices of fir lumber in market adjacent to Cascade Range Forest Reserve, Oregon.

Grade.	Size.	Finish.	Price.
	Inches.		*Per M feet B. M.*
Common	1 by 12	Rough	$10.00
Do	1 by 12	Surface, 2 sides	11.00
Flooring, V. G. No. 1	1 by 4	Dressed and matched	23.00
Flooring, V. G. No. 2	1 by 4	do	18.00
Ceiling, No. 1	⅝ by 6	Beaded and plain	18.00
Ceiling, No. 2	⅝ by 6	do	15.00
Wainscoting, No. 1	⅝ by 4		18.00
Do	⅝ by 4		15.00
Shiplap, common	1 by 8		12.00
Fencing, No. 1	1 by 4		10.00
Fencing, No. 2	1 by 4		8.50
Pickets	1 by 3 or 1¼ by 1¼	Surface 4 sides	20.00
Lath			[a] 2.50

[a] Per 1,000.

Prices of cedar run from 25 to 40 per cent more than above.

Prices of spruce run from 10 to 50 per cent more than above.

Prices of hemlock are same as fir (no demand).

Shingles, $2.30 per 1,000.

During 1900 and 1901 stumpage advanced from 50 cents to 75 cents per M, and labor from $1.25 to $2 per day.

SETTLEMENTS AND IMPROVEMENTS.

In addition to the sawmills and the cleared or cultivated areas mentioned elsewhere in this report, the improvements within the forest reserve consist of 91 houses or cabins and 19 barns. No enumeration was made of the lodges or cabins on the Indian reservation.

Three valleys contain settlements. On the north fork of the Santiam River, in T. 10 S., R. 5 E., is the small town of Detroit, the terminus of the Corvallis and Eastern Railroad and the center of the present logging operations in this district. The settlers along McKenzie River in T. 16 S., Rs. 5 and 6 E., consist of ranchers and stock raisers. Near the McKenzie bridge in section 14 is a summer hotel and store. Metoluis River Valley in T. 13 S., R. 9 E., is settled by ranchers and stock raisers.

Prospectors, land claimants, and trappers have built many of the cabins in isolated places reached only by trails, and occupy them only a few months in the year. The sentiment of the people, so far as learned, was in favor of the forest reserve policy.

A salmon hatchery, operated by the State of Oregon, is located in sec. 15, T. 6 S., R. 6 E., where from 3,000,000 to 5,000,000 fry are hatched annually. The improvements consist of the trough sheds and a house for the workmen. It is reached by a trail from Garfield.

THE FOREST AS A WATER CONSERVER.

The timber claimant, the logger, the speculator, and the mill owner look upon a well-forested area as containing so much merchantable stuff, but the forests have a broader and greater utility; one which affects the commonwealth of the State for all time, and which will in the near future compel recognition. It is the duty of the forest cover to retard the surface drainage and protect the snows from the warm winds, to the end—a most important one—that the minimum flow of the streams may be as great as possible and the floods reduced.

It does not follow that the interests of the lumberman and of the people must clash. There are very few areas where every tree is of merchantable size, but the forests are of many species and of different growths, or, as a logger would say, "mixed and spotted." Such mixed forests would not be "logged clean," and the logging, or rather the culling of the best trees, would not necessarily hurt the forest cover as a water conserver.

For illustration, in the area treated in this report, an average acre of timbered ground would be on a steep hillside, 3,500 feet above the sea, and would support a mixed forest with a stand of 6,000 feet B. M., together with about 500 seedlings and saplings of the same species, and some deciduous undergrowth. The surface soil

would be rock and sand with 4 to 6 inches of humus, littered with the trunks and limbs of immature trees killed by overshading. At present prices the 6,000 feet of standing timber would have a value of $4.50 on the stump if the area in which it is situated was being logged; otherwise its value would be speculative. If all the timber and young coniferous growth were removed, it would have some value for grazing. It is assumed to be nonmineral and nonarable land, but as it is underlaid by solid basalt the stream which drains it receives about 75 per cent of the 3,000 tons of snow and rain which fall upon it annually.

Of the features of this average acre mentioned there are two which if removed would improve it, both as a watershed and as grazing land, namely, the large timber and the litter. Of these the logger desires one, namely, the timber, the same timber which was in part responsible for the existence of the litter. This is the proposition generally stated, and its details would vary according to location.

The removal of the larger trees admits light and air to the greater number of trees under merchantable size, increasing their foliage and allowing them to grow so rapidly that the crop for the acre is not materially less than if the large trees had remained. The cover of interwoven foliage is still there to protect the snows and prevent excessive evaporation.

The litter is generally of little use for fuel, nor is much of it used for skid roads during logging operations, and the logger always leaves more litter than he uses. It is in every way undesirable, greatly increasing the danger from fire in summer and preventing the compacting of the snows in winter. It is the result of a strife among the trees which man can in a measure control.

On the average acre a small broad-crowned fir could, as a water conserver, furnish more power than if it were taken for fuel. In the State of Oregon the question of wood fuel has not yet become vital, nor will it for many decades, but the question of water power is already of the utmost importance, particularly as distance and location have ceased to be governing factors since the introduction of electrical transmission.

The following is information relative to the present and prospective use of water gleaned from reliable sources during the season's work. It will serve to emphasize some of the statements made above, but is by no means complete.

At Oregon City the falls of the Willamette River could give about 30,000 horsepower at the minimum flow, which occurs in August or September. Twenty-five thousand horsepower is now developed, of which the city of Portland uses 20 per cent and the mills and factories at Oregon City 60 per cent. It is used also for electric lighting, street-car service, and general power transmission.

The Clackamas River is used for sawmills and grist mills and for log and shingle-bolt driving. At the State salmon hatchery, which is located on this river in T. 6 S.,

R. 6 E., there were 5,000,000 eggs hatched in 1901. In September the river was so low that the salmon were all badly bruised running up to spawn.

The North Fork of the Santiam River is drivable outside of the forest reserve. It will furnish power for a large paper mill now in course of construction at Niagara, a station on the Corvallis and Eastern railway in T. 9 S., R. 4 E. It furnishes water power for the sawmill of the Curtis Lumber Company at Mill City. A diversion is made near Mehama by a canal which was the channel of Mill Creek, and is taken 25 miles to Salem, and at the State penitentiary has a fall of 11 feet and develops 91 horsepower for a pumping plant and 100 horsepower for industrial purposes. In addition there is at Salem a woolen mill using 100 horsepower, an agricultural-implement factory using 100 horsepower, a flouring mill using 200 horsepower, and three factories using about 200 horsepower. The same ditch furnishes power for flour mills at Stayton, Aumsville, and at Turner. At Sidney there is a favorable site for a power plant, with a fall of 48 feet and a capacity of 1,000 horsepower.

The South Fork of the Santiam River at the city of Lebanon runs the electric lights, a gristmill, a planing mill, and a paper mill. About 250 horsepower is used. A portion of the water is diverted by 14 miles of canal to the city of Albany, where it has a fall of from 28 to 35 feet and develops power for 1,000 electric lights, two gristmills, chair factory, iron works, woolen mills, grain elevator, and an ice factory. At Waterloo there was an available head of 30 feet, giving 200 horsepower for a woolen mill which was burned in 1899.

The Thomas Fork of the Santiam at the town of Scio furnishes power for electric lights and a gristmill. This stream heads near the west boundary of the forest reserve.

Squaw Creek is used for irrigating 1,500 acres of land in T. 15 S., R. 10 E.; also runs a sawmill.

Metoluis River is used for irrigation by settlers in and out of the reserve.

Mill Creek furnishes power for sawmill. Has a small flow, but is well situated for irrigating.

Shitike Creek is water supply for the Warm Springs Indian Agency. It runs pumping plant, electric lights, gristmill, and woodworking mill.

White River furnishes power for Fryer's sawmill. It will also run power plant for electric lighting The Dalles. A plant is in course of construction 4 miles below Tygh and 25 miles outside of the reserve. The stream is also used for irrigating the Oakgrove and Juniper Flat country.

DESCRIPTIONS OF TOWNSHIPS.

Township 5 South, Range 5 East.

This township lies on the western edge of the reserve, well down the west slope of the range. Across its northeast corner flows Clackamas River. The surface is composed of steep ridges and deep gorges cut by northward-flowing branches of the Clackamas. Its soil is rocky and sandy, the litter and humus light.

The timber at lower altitudes is of good quality and size. On the high bench lands, such as those in sections 20 and 29, the trees are stumpy, and under such conditions Patton hemlock will average 50 feet in height, lovely fir 60, and noble fir 100. About 10 per cent of the timber is diseased. The average stand of timber on the timbered area is 14,600 feet per acre.

Classification of lands in T. 5 S., R. 5 E.

	Acres.
Total area	22,983
Timbered area	22,933
Burned area	50

Stand of timber species in T. 5 S., R. 5 E.

	Feet B. M.
Total	333,577,500
White pine	3,335,775
Noble fir	66,715,500
Lovely fir	6,671,550
Red fir	200,146,500
Mertens hemlock	26,686,200
Patton hemlock	6,671,550
Red cedar	23,350,425

Township 5 South, Range 6 East.

This township lies on the west slope of the range. It is traversed by the Clackamas River, flowing northwest. Its surface is very broken, consisting of gorges cut by branches of the Clackamas, with ridges separating them, and the narrow valley itself. The soil is rocky and the litter and humus light.

All over this township are found excellent wild cheat, rye, and other forage grasses, but owing to its inaccessibility it has never been used for a range. A considerable area on the north is burned. Otherwise most of the township contains a good stand of timber, the average being 13,300 feet per acre, with 10 per cent diseased.

Classification of lands in T. 5 S., R. 6 E.

	Acres.
Total area	23,312
Timbered area	20,782
Burned area	2,530

Stand of timber species in T. 5 S., R. 6 E.

	Feet B. M.
Total	276,375,000
White pine	2,763,750
Noble fir	2,763,750
Lovely fir	2,763,750
White fir	2,763,750
Red fir	221,100,000
Mertens hemlock	27,637,500
Engelmann spruce	2,763,750
Red cedar	13,818,750

Township 5 South, Range 7 East.

This township lies upon the west slope of the range. Its surface consists mainly of broad plateaus of lava the slopes of which are drained by Shellrock Creek to the Clackamas. The soil is rocky, the litter and humus medium. The northern tier of sections and an area in the southwest were burned many years ago and subsequently used for sheep pasturage.

The timberless areas are too high for agriculture. The average stand of timber on the timbered land is 6,100 feet per acre. The proportion of diseased timber is 8 per cent.

Classification of lands in T. 5 S., R. 7 E.

	Acres.
Total area	23,040
Timbered area	17,640
Burned area	5,110
Timberless area	290

Stand of timber species in T. 5 S., R. 7 E.

	Feet B. M.
Total	108,205,000
White pine	1,082,050
Lodgepole pine	2,164,100
Noble fir	5,410,250
Lovely fir	5,410,250
White fir	5,410,250
Subalpine fir	3,246,150
Red fir	70,333,250
Mertens hemlock	10,820,500
Patton hemlock	1,082,050
Engelmann spruce	1,082,050
Red cedar	2,164,100

Township 5 South, Range 8 East.

This township lies just west of the summit of the range, and is drained by Shellrock and Oakgrove creeks to Clackamas River. This surface consists of a high,

undulating plateau with little relief. The soil is rocky and sandy; the litter and humus are very light. The forest is open, affording some pasturage.

The average stand of timber is 10,000 feet per acre, and 5 per cent of it is diseased.

Classification of lands in T. 5 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	20,810
Burned area	2,150
Timberless area	80

Stand of timber species in T. 5 S., R. 8 E.

	Feet B. M.
Total	207,460,000
White pine	8,298,400
Lodgepole pine	2,074,600
Noble fir	2,074,600
Lovely fir	4,149,200
White fir	10,373,000
Subalpine fir	8,298,400
Red fir	124,476,000
Mertens hemlock	31,119,000
Patton hemlock	8,298,400
Engelmann spruce	4,149,200
Tamarack	4,149,200

Township 5 South, Range 8½ East.

This fractional township lies upon the summit of the range. Its surface is level or rolling, and much of it is marshy. The soil is sandy, the litter light.

The average stand of timber is 11,300 feet per acre. Five per cent is diseased.

Classification of lands in T. 5 S., R. 8½ E.

	Acres.
Total area	6,340
Timbered area	4,980
Burned area	20
Timberless area	1,340

Stand of timber species in T. 5 S., R. 8½ E.

	Feet B. M.
Total	56,070,000
White pine	3,364,200
Noble fir	560,700
White fir	560,700
Subalpine fir	560,700
Red fir	33,642,000
Mertens hemlock	11,214,000
Patton hemlock	1,121,400
Engelmann spruce	1,121,400
Tamarack	3,924,900

Township 5 South, Range 9 East.

This township lies on the summit of the range, and has a broadly undulating surface. The southern part is in the Warm Springs Indian Reservation. Clackamas Meadows, in the southwest corner of the township, contain nearly two sections of open country with rich black soil. Elsewhere the soil is rocky and sandy, and the litter in the forested regions is medium.

The average stand of timber is 8,900 feet per acre, and 5 per cent is diseased.

Classification of lands in T. 5 S., R. 9 E.

	Acres.
Total area	23,009
Timbered area	17,979
Burned area	3,980
Timberless area	1,050

Stand of timber species in T. 5 S., R. 9 E.

	Feet B. M.
Total	159,326,500
Yellow pine	3,186,530
White pine	3,186,530
Lodgepole pine	1,593,265
Noble fir	1,593,265
Lovely fir	1,593,265
White fir	4,779,795
Red fir	103,562,225
Mertens hemlock	31,865,300
Engelmann spruce	1,593,265
Red cedar	1,593,265
Tamarack	4,779,795

Township 5 South, Range 10 East.

This township lies east of the divide, and is drained to the eastward by branches of White River. Part of the southern half lies in the Warm Springs Indian Reservation. Its surface is broadly undulating. The soil is sandy with loose rock, and the litter is light.

There is a small sawmill in section 8 which has culled the timber in a trifling area about it. The average stand of timber in the timbered area is 11,700 feet per acre, and only 2 per cent is diseased.

Classification of lands in T. 5 S., R. 10 E.

	Acres.
Total area	23,040
Timbered area	22,470
Burned area	350
Logged area	80
Timberless area	140

Stand of timber species in T. 5 S., R. 10 E.

	Feet B. M.
Total	262,285,000
Yellow pine	104,914,000
White fir	13,114,250
Red fir	131,142,500
Mertens hemlock	7,868,550
Tamarack	5,245,700

Township 5 South, Range 11 East.

This township lies east of the divide, well out upon the plateau. The extreme southern portion lies in the Warm Springs Indian Reservation. The surface is quite level and is drained to the eastward by White River. It is situated near the eastern limit of the timber region, as is shown by the fact that much of the eastern part of the township is timberless. The soil is sandy and gravelly and the litter very light. The average stand of timber is 2,500 feet per acre.

Classification of lands in T. 5 S., R. 11 E.

	Acres.
Total area	22,955
Timbered area	18,145
Burned area	670
Timberless area	4,140

Stand of timber species in T. 5 S., R. 11 E.

	Feet B. M.
Total	43,880,000
Yellow pine	30,716,000
White fir	1,316,400
Red fir	10,970,000
Tamarack	877,600

Township 6 South, Range 5 East.

This township lies west of the summit of the range and is drained by Fish Creek and its tributaries. The surface in the main is mountainous, being composed of steep ridges with gorges cut by the branches of Fish Creek. The western half of the township is more undulating, and sections 5 and 8 afford some pasturage for horses, although the entire township would be poor grazing. The soil is rocky with some loam in sections 10 and 15. The litter is medium and the humus generally light, except along the creek bottoms, where it is medium.

A small percentage of the timbered area has been burned. The timber on the exposed ridges has been wind shaken, particularly affecting the hemlock. The average stand of timber on the timbered area is 14,100 feet per acre, 10 per cent of it being diseased.

Classification of lands in T. 5 S., R. 7 E.

	Acres.
Total area	[illegible]
Timbered area	30,200
Burned area	2,670

Stand of timber species in T. 5 S., R. 7 E.

	Feet B. M.
Total	285,095,000
Noble fir	42,764,250
Lovely fir	28,509,500
White fir	8,552,850
Whitebark fir	8,552,850
Red fir	142,547,500
Mertens hemlock	37,062,350
Patton hemlock	5,701,900
Red cedar	11,403,800

Township 6 South, Range 6 East.

This township lies west of the summit of the range and is drained by the Clackamas River, which traverses the township in a northerly direction. The surface is rough and broken with deep gorges cut by numerous branches of the Clackamas. The soil is rocky with the exception of sections 10 and 15, where along the river are found several patches of rich, cultivable loam land. The litter is medium.

Much of the timber is pinney even when the trees are 3 or 4 feet in diameter. The average stand of timber in the timbered area is 20,400 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 6 S., R. 6 E.

	Acres.
Total area	23,567
Timbered area	22,597
Burned area	970

Stand of timber species in T. 6 S., R. 6 E.

	Feet B. M.
Total	461,247,500
White pine	4,612,475
Noble fir	23,062,375
Lovely fir	18,449,900
White fir	9,224,950
Red fir	280,810,875
Mertens hemlock	69,187,125
Patton hemlock	4,612,475
Red cedar	32,287,325

Township 6 South, Range 7 East.

This township lies west of the summit of the range, its southern half being traversed by the Clackamas River, while across the extreme northern part flows Oakgrove Creek. The surface is generally hilly, with a high, broad table-land lying toward the east. The soil is rocky and sandy with black soil occasionally in the valleys. The litter is medium.

In section 30 and extending to section 25, T. 6 S., R. 6 E., are hot springs, distributed over an area of 20 acres, with a temperature of 188°.

About 5 per cent of the total area of the township is burned, the most of it lying in the southwest corner having been burned in 1897. The average stand of timber in the timbered area is 16,200 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 6 S., R. 7 E.

	Acres.
Total area	24,463
Timbered area	23,313
Burned area	1,150

Stand of timber species in T. 6 S., R. 7 E.

	Feet B. M.
Total	360,415,500
White pine	3,604,155
Noble fir	10,812,465
Lovely fir	14,416,620
White fir	3,604,155
Red fir	252,290,850
Mertens hemlock	54,062,325
Red cedar	21,624,930

Township 6 South, Range 8 East.

This township lies just west of the summit of the range, its western half being drained by tributaries to Oakgrove Creek and Clackamas River. Its surface is a broadly undulating plateau, and the soil is sandy with some light loam. The litter is light.

The average stand of timber in the timbered area is 5,100 feet per acre. The proportion diseased is 5 per cent.

Classification of lands in T. 6 S., R 8 E.

	Acres.
Total area	23,359
Timbered area	21,549
Burned area	1,810

Stand of timber species in T. 6 S., R. 8 E.

	Feet B. M.
Total	110,339,000
Noble fir	5,516,950
White fir	2,206,780
Red fir	77,237,300
Mertens hemlock	22,067,800
Engelmann spruce	2,206,780
Tamarack	1,103,390

Township 6 South, Range 8½ East.

This fractional township lies just on the summit of the range at an elevation of 5,000 feet. The eastern portion is in the Warm Springs Indian Reservation. The surface is rolling, soil sandy, and litter light.

Nearly 20 per cent of the total area is burned. The average stand in the timbered area is 10,150 feet per acre, 5 per cent of which is diseased.

Classification of lands in T. 6 S., R. 8½ E.

	Acres.
Total area	7,230
Timbered area	5,950
Burned area	1,240
Timberless area	40

Stand of timber species in T. 6 S., R. 8½ E.

	Feet B. M.
Total	60,400,000
Noble fir	6,040,000
Lovely fir	9,060,000
White fir	4,228,000
Red fir	21,140,000
Mertens hemlock	15,100,000
Patton hemlock	1,208,000
Engelmann spruce	1,812,000
Tamarack	1,812,000

Township 6 South, Range 9 East.

This township is on the summit of the range and entirely in the Warm Springs Indian Reservation. It has a broadly undulating surface drained to the eastward by Beaver Creek and Warm Springs River. The surface is covered with rock and sand, and the litter is light.

The average stand of timber in the timbered area is 3,100, of which 2 per cent is diseased.

Classification of lands in T. 6 S., R. 9 E.

	Acres.
Total area	23,023
Timbered area	20,763
Burned area	2,160
Timberless area	100

A. VIEW FROM CONE PEAK.

B. GROVE OF INCENSE CEDAR.

Stand of timber species in T. 6 S., R. 9 E.

	Feet B. M.
Total	63,205,500
Yellow pine	31,602,750
Lovely fir	3,160,275
White fir	6,320,550
Red fir	15,801,375
Mertens hemlock	1,264,110
Engelmann spruce	1,264,110
Red cedar	632,055
Tamarack	3,160,275

Township 6 South, Range 10 East.

This township, lying just east of the divide, and in the Warm Springs Indian Reservation, is a broad level plateau, only slightly undulating in its western half. It is traversed in a southeasterly direction by Bear Creek and Beaver Creek and their tributaries. The soil is rocky and sandy, the litter light.

It is generally timbered with an average stand of 3,500 feet per acre.

Classification of lands in T. 6 S., R. 10 E.

	Acres.
Total area	23,040
Timbered area	21,970
Burned area	990
Timberless area	80

Stand of timber species in T. 6 S., R. 10 E.

	Feet B. M.
Total	76,895,000
Yellow pine	69,205,500
White fir	3,844,750
Red fir	3,844,750

Township 6 South, Range 11 East.

This township lies east of the divide in the Warm Springs Indian Reservation. Its surface is level. The soil is composed of sand and loose rock, the litter is very light. About 10 per cent of the total area of the township is timberless. The timber consists entirely of yellow pine, having an average stand in the timbered area of 1,000 feet per acre.

Classification of lands in T. 6 S., R. 11 E.

	Acres.
Total area	23,156
Timbered area	20,726
Timberless area	2,430
	Feet B. M.
Total stand of timber, all yellow pine	20,726,000

Township 7 South, Range 5 East.

This township lies on the western border of the reserve, and is well drained by Nohorn Creek and Hotsprings Fork, tributaries of the Collawash River, and their branches. The surface consists of steep ridges and deep gorges through which flow the numerous mountain streams. The soil is composed of thin sand covering rock. The litter is medium, the humus very heavy, particularly in sections 28 and 29.

The township is almost entirely covered with timber, much of it, however, especially in sections 14 and 23, being of slow growth. The average stand of timber in the timbered area is 13,700 feet per acre, 10 per cent of which is diseased.

Hot sulphur springs in section 26 cover an area of 5 acres.

Classification of lands in T. 7 S., R. 5 E.

	Acres.
Total area	22,362
Timbered area	22,202
Burned area	160

Stand of timber species in T. 7 S., R. 5 E.

	Feet B. M.
Total	303,265,000
White pine	3,032,650
Noble fir	30,326,500
Lovely fir	18,195,900
White fir	3,032,650
Red fir	197,122,250
Mertens hemlock	30,326,500
Patton hemlock	6,065,300
Red cedar	15,163,250

Township 7 South, Range 6 East.

This township lies west of the summit and is drained by the Collawash River, which flows across the township in a northwesterly direction, by the Hotsprings River, and by other tributaries to the Collawash. The surface is broken and rough, with abrupt ridges and deep canyons carved out by mountain streams. The soil is composed of sand and gravel. The litter is heavy and medium, the humus heavy, except at high elevations.

The timber is of unusually uniform size and of good merchantable quality. The average stand in the timbered area is 18,400 feet per acre, 10 per cent of which is diseased.

Classification of lands in T. 7 S., R. 6 E.

	Acres.
Total area	22,936
Timbered area	22,466
Burned area	470

Stand of timber species in T. 7 S., R. 6 E.

	Feet B. M.
Total	413,211,000
White pine	4,132,110
Noble fir	28,924,770
Lovely fir	24,792,660
White fir	8,264,220
Red fir	268,587,150
Mertens hemlock	49,585,320
Patton hemlock	4,132,110
Red cedar	24,792,660

Township 7 South, Range 7 East.

This township, lying west of the summit of the range, consists of a high plateau with its slopes, drained on the west by tributaries to the Collawash and on the east by tributaries to the Clackamas. The soil is sandy and rocky, the litter medium.

About 12 per cent of the total area of the township is burned. The average stand of timber in the timbered area is 13,000 feet per acre, 5 per cent of which is diseased.

The northern and eastern parts of the township in the vicinity of Clackamas River were formerly a favorite hunting and fishing resort of the Indians.

Classification of lands in T. 7 S., R. 7 E.

	Acres.
Total area	23,040
Timbered area	2,870
Burned area	20,170

Stand of timber species in T. 7 S., R. 7 E.

	Feet B. M.
Total	261,275,000
Noble fir	13,063,750
Lovely fir	39,191,250
White fir	13,063,750
Subalpine fir	2,612,750
Red fir	156,765,000
Mertens hemlock	26,127,500
Patton hemlock	5,225,500
Red cedar	5,225,500

Township 7 South, Range 8 East.

This township, lying on the summit of the Cascades, is a broad, high plateau, traversed in the western portion by the Clackamas River flowing northerly, and drained by that river and one of its largest tributaries. The soil is rocky, with a thin covering of sand, with small areas of good soil along the river in sections 6,

7, and 17, whose elevation and location, however, prevent them from being classed as arable. The entire township is suitable for grazing, and for years elk have been hunted in the natural parks by the Indians.

The average stand of timber in the timbered area is 6,100 feet per acre, 2 per cent of it being diseased.

Classification of lands in T. 7 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	21,870
Burned area	1,170

Stand of timber species in T. 7 S., R. 8 E.

	Feet B. M.
Total	132,405,000
Noble fir	13,240,500
Lovely fir	13,240,500
White fir	6,620,250
Subalpine fir	1,324,050
Red fir	72,822,750
Mertens hemlock	13,240,500
Patton hemlock	7,944,300
Engelmann spruce	2,648,100
Red cedar	1,324,050

Township 7 South, Range 8½ East.

This fractional township lies just on the summit of the range, its surface consisting of a broad, high, undulating plateau. The eastern half is in the Warm Springs Indian Reservation. The soil is sandy and rocky, the litter light.

Thirty per cent of the total area is burned. The average stand of timber in the timbered area is 3,200 feet per acre.

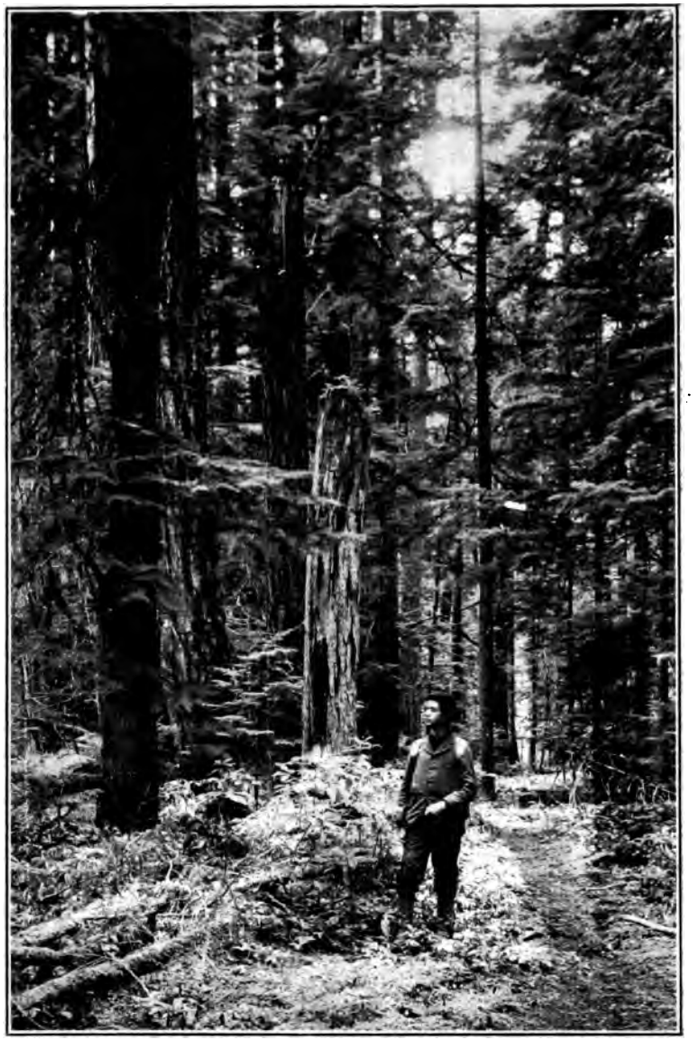
Classification of lands in T. 7 S., R. 8½ E.

	Acres.
Total area	7,600
Timbered area	5,320
Burned area	2,280

Stand of timber species in T. 7 S., R. 8½ E.

	Feet B. M.
Total	16,795,000
Noble fir	3,359,000
Lovely fir	1,679,500
White fir	1,679,500
Subalpine fir	839,750
Red fir	1,679,500
Mertens hemlock	3,359,000
Patton hemlock	3,359,000
Engelmann spruce	839,750

A. THICK STAND OF YOUNG RED FIR.



B. MIXED FOREST OF YELLOW FIR.

Township 7 South, Range 9 East.

This township lies upon the summit of the range in the Warm Springs Indian Reservation. Its surface is a broadly undulating plateau drained by Warm Springs River and its tributaries. The soil is composed of sand and loose rock; the litter is light.

The township is entirely timbered, the average stand being 2,600 feet per acre.

Classification of lands in T. 7 S., R. 9 E.

	Acres.
Timbered area	23,376

Stand of timber species in T. 7 S., R. 9 E.

	Feet B. M.
Total	59,451,000
Yellow pine	41,615,700
Lovely fir	5,945,100
White fir	2,972,550
Subalpine fir	2,972,550
Red fir	2,972,550
Patton hemlock	2,972,550

Township 7 South, Range 10 East.

This township lies east of the divide in the Warm Springs Indian Reservation. Its surface is a somewhat undulating plateau, and is drained to the eastward by Warm Springs River and Badger Creek. The soil is composed of sand and loose rock; the litter is light.

About 7 per cent of the area is burned or timberless. The average stand of timber in the timbered area is 3,500 feet per acre.

Classification of lands in T. 7 S., R. 10 E.

	Acres.
Total area	22,705
Timbered area	21,275
Burned area	670
Timberless area	760

Stand of timber species in T. 7 S., R. 10 E.

	Feet B. M.
Total	74,462,500
Yellow pine	63,293,125
Lodgepole pine	3,723,125
White fir	3,723,125
Red fir	3,723,125

Township 7 South, Range 11 East.

This township, lying east of the divide in the Warm Springs Indian Reservation, has a level surface drained to the southeastward by Warm Springs River and Beaver

Creek, which traverse the township. The soil is composed of sand and loose rock; the litter is light.

Of the total area of the township 56 per cent is timberless. The timber consists entirely of yellow pine and has an average stand in the timbered area of 1,000 feet per acre.

Classification of lands in T. 7 S., R. 11 E.

	Acres.
Total area	23.136
Timbered area	10.116
Timberless area	13.020

Stand of timber species.

	Feet B. M.
Yellow pine	10,116,000

Township 8 South, Range 5 East.

This township lies on the western border of the reserve, well west of the summit of the range. It has a high, mountainous surface, somewhat undulating toward the east. The Little North Fork of the Santiam and Gold Creek drain the western and southern portions. The soil is composed mainly of rock, found loose and in ledges covered with sand. The litter is medium. Considerable prospecting for gold and silver has been done in this township, and there are two mining camps, one located in sections 29 and 30 and the other in section 34.

About 16 per cent of the total area is burned. The average stand of timber in the timbered area is 7,500 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 8 S., R. 5 E.

	Acres.
Total area	26,720
Timbered area	22,530
Burned area	4,190

Stand of timber species in T. 8 S., R. 5 E.

	Feet B. M.
Total	168,790,000
Noble fir	16,879,000
Lovely fir	16,879,000
White fir	8,439,500
Red fir	101,274,000
Mertens hemlock	16,879,000
Patton hemlock	6,751,600
Red cedar	1,687,900

Township 8 South, Range 6 East.

This township, lying west of the summit of the range, has a rough, mountainous surface, with a rocky soil covered with a thin layer of sand. The litter is medium.

In the western part mining has been undertaken, but the region is rough and almost inaccessible. Forage is scarce, with only a few acres of pasturage in the entire township.

The average stand of timber in the timbered area is 9,600 feet per acre, 10 per cent of which is diseased.

Classification of lands in T. 8 S., R. 6 E.

	Acres.
Total area	26,000
Timbered area	23,860
Burned area	2,140

Stand of timber species in T. 8 S., R. 6 E.

	Feet B. M.
Total	228,355,000
Noble fir	22,835,500
Lovely fir	22,835,500
White fir	6,850,650
Red fir	91,342,000
Mertens hemlock	22,835,500
Patton hemlock	45,671,000
Engelmann spruce	11,417,750
Alaska cedar	4,567,100

Township 8 South, Range 7 East.

This township lies west of the divide. Its surface is high and rocky, undulating toward the east. It is drained to the northwest by East Fork, a branch of the Collawash. The soil is composed of rock and gravel; the litter is light. Were it not considered practically inaccessible by sheepmen, some of the land would be fair grazing, wild cheat, rye, and other forage plants being found in small openings on the rocky hillsides.

The average stand of timber in the timbered area is 9,900 feet per acre, 5 per cent of which is diseased.

Classification of lands in T. 8 S., R. 7 E.

	Acres.
Total area	25,910
Timbered area	24,750
Burned area	1,160

Stand of timber species in T. 8 S., R. 7 E.

	Feet B. M.
Total	243,995,000
Noble fir	97,980,000
Lovely fir	85,398,250
White fir	4,879,900
Red fir	48,799,000
Hemlock	7,319,850

Township 8 South, Range 8 East.

This township lies just west of the summit of the range, and its surface consists of a high, undulating plateau, drained by the Clackamas River, which traverses the township in a northwesterly direction. The soil is composed of rock, sand, and gravel; the litter is light.

Considerable areas of this township appear to have been burned over about a hundred years ago. Small areas have been reclaimed by young and worthless lodgepole pines. The average stand of timber in the timbered area is 4,300 feet per acre.

Classification of lands in T. 8 S., R. 8 E.

	Acres.
Total area	25,820
Timbered area	23,790
Burned area	1,830
Timberless area	200

Stand of timber species in T. 8 S., R. 8 E.

	Feet B. M.
Total	102,790,000
Lovely fir	15,418,500
Red fir	5,139,500
Patton hemlock	82,232,000

Township 8 South, Range 8½ East.

This township lies in the Warm Springs Indian Reservation, upon the summit of the range, at an elevation of 6,000 feet. The surface is a rolling plateau. The soil is rocky and sandy; the litter medium.

Twenty-five per cent of the total area of the township is either burned or timberless. The average stand of timber in the timbered area is 1,400 feet per acre.

Classification of lands in T. 8 S., R. 8½ E.

	Acres.
Total area	7,680
Timbered area	5,740
Burned area	1,780
Timberless area	160

Stand of timber species in T. 8 S., R. 8½ E.

	Feet B. M.
Total	7,720,000
White fir	386,000
Subalpine fir	1,158,000
Patton hemlock	6,176,000

A. VIEW FROM DEVILS PEAK.

B. SMALL LAKE AND WILD MEADOW AT PEASLEY'S RANCH.

Township 8 South, Range 9 East.

This township lies just east of the divide and in the Warm Springs Indian Reservation. Its surface is high and rolling, with broad spurs sloping eastward, and is drained by tributaries to Badger Creek and Mill Creek. The soil is rocky and sandy, the litter medium.

About 14 per cent of the total area of the township is burned, these burns appearing to have occurred during the past fifty years, some of the areas having been burned over several times. The average stand of timber in the timbered area is 13,800 feet per acre. The trail shown on the map leads westerly to the Indian huckleberry patches.

Classification of lands in T. 8 S., R. 9 E.

	Acres.
Total area	23,040
Timbered area	19,830
Burned area	3,130
Timberless area	80

Stand of timber species in T. 8 S., R. 9 E.

	Feet B. M.
Total	27,355,000
Yellow pine	13,677,500
White fir	1,367,750
Subalpine fir	2,735,500
Patton hemlock	9,574,250

Township 8 South, Range 10 East.

This township lies east of the divide in the Warm Springs Indian Reservation. It has a rolling surface drained to the eastward by Mill Creek, which traverses the township. The soil is sandy or composed of loose rocks; the litter is light.

A considerable area of the township is timberless. In section 23 there is a sawmill operated by the Indians to supply lumber to the Government agency when needed. It has made very little drain on the forest for logs, simply culling out some of the best trees from the neighboring forest. The average stand of timber in the timbered area is 2,900 feet per acre.

Classification of lands in T. 8 S., R. 10 E.

	Acres.
Total area	22,186
Timbered area	21,296
Burned area	90
Timberless area	800

Stand of timber species in T. 8 S., R. 10 E.

	Feet B. M.
Total	61,346,000
Yellow pine	49,076,800
White fir	3,067,300
Subalpine fir	3,067,300
Red fir	3,067,300
Patton hemlock	3,067,300

Township 8 South, Range 11 East.

This township, lying on the east of the divide and in the Warm Springs Indian Reservation, has a level open surface drained to the eastward by Mill Creek and Warm Springs River. The soil consists of sand and loose rock; the litter is light.

Of the total area of the township 94 per cent is timberless, the timber consisting entirely of yellow pine, which in the timbered area averages 1,000 feet per acre.

Classification of lands and stand of timber in T. 8 S., R. 11 E.

	Acres.
Total area	22,315
Timbered area	2,305
Timberless area	20,010
	Feet B. M.
Total stand of timber, all yellow pine	2,305,000

Township 9 South, Range 5 East.

This township, lying west of the summit and on the western border of the reserve, has a high, broken surface consisting of steep ridges and deep gorges, through which flow Cedar Creek, French Creek, and other mountain streams. The soil is composed of rock, gravel, and sand; the litter is light. About 100 acres of arable land are found in sections 25 and 35.

The average stand of timber in the timbered area is 12,200 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 9 S., R. 5 E.

	Acres.
Total area	23,748
Timbered area	20,048
Burned area	3,600
Timberless area	100

Township 9 South, Range 7 East.

This township lies east of the divide, its surface consisting of high, rocky, mountain plateaus, drained to the westward by the Breitenbush River and its tributaries. The soil is very rocky, with some loam in bottom. The litter is medium.

A considerable portion of the township has been burned. The areas in sections 5 and 8 were burned in 1895; those in sections 24 and 25 before the arrival of whites, and those near Scorpion Mountain in 1880 and again in 1893. In section 20, distributed over an area of about 10 acres, are the Breitenbush Hot Springs, in whose vicinity are 100 acres of arable land. The average stand of timber in the timbered area is 7,500 feet per acre, the proportion diseased being 10 per cent.

Classification of lands in T. 9 S., R. 7 E.

	Acres.
Total area	23,020
Timbered area	19,830
Burned area	3,190

Stand of timber species in T. 9 S., R. 7 E.

	Feet B. M.
Total	149,045,000
White pine	1,490,450
Noble fir	2,980,900
Lovely fir	4,471,350
White fir	14,904,500
Red fir	96,879,250
Mertens hemlock	14,904,500
Patton hemlock	2,980,900
Red cedar	7,452,250
Incense cedar	2,980,900

Township 9 South, Range 8 East.

This township lies near the summit of the range, on the western border of the Warm Springs Indian Reservation. It forms a broad mountain plateau, with an elevation of 6,000 feet. It is drained by the North Fork of the Breitenbush River. The soil is composed of rock and sand, the litter being light.

About 15 per cent of the total area is burned. The average stand of timber in the timbered area is 1,500 feet per acre, of which 2 per cent is diseased.

Classification of lands in T. 9 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	19,320
Burned area	3,450
Timberless area	270

Stand of timber species in T. 9 S., R. 8 E.

	Feet B. M.
Total	29,475,000
White pine	294,750
Noble fir	1,473,750
Lovely fir	4,421,250
Subalpine fir	884,250
Red fir	19,158,750
Mertens hemlock	1,473,750
Patton hemlock	589,500
Engelmann spruce	589,500
Red cedar	589,500

Township 9 South, Range 8½ East.

This township lies on the very summit of the range, in the Warm Springs Indian Reservation, its surface being high and rolling. Over the northern part are distributed numerous mountain lakes. The soil is composed of rock and sand and the litter is light. Twelve per cent of the total area is either burned or timberless. The average stand of timber in the timbered area is 1,000 feet per acre.

Classification of lands in T. 9 S., R. 8½ E.

	Acres.
Total area	8,200
Timbered area	7,190
Burned area	480
Timberless area	530

Stand of timber species in T. 9 S., R. 8½ E.

	Feet B. M.
Total	7,190,000
White fir	719,000
Subalpine fir	2,157,000
Patton hemlock	4,314,000

Township 9 South, Range 9 East.

This township lies just east of the divide in the Warm Springs Indian Reservation. Its high surface is an undulating plateau, drained to the eastward by Shitike Creek, which traverses the township. The soil consists of rock ledges and bowlders covered with sand. The litter is light.

The average stand of timber in the timbered area is 1,200 feet per acre.

Classification of lands in T. 9 S., R. 9 E.

	Acres.
Total area	23,100
Timbered area	21,370
Burned area	1,730

Stand of timber species in T. 9 S., R. 9 E.

	Feet B. M.
Total	25,395,000
Yellow pine	6,348,750
White fir	1,269,750
Subalpine fir	6,348,750
Patton hemlock	11,427,750

Township 9 South, Range 10 East.

This township lies east of the summit of the range in the Warm Springs Indian Reservation. Its surface is broadly undulating, the eastern portion being generally level. The soil consists of rock ledges and bowlders covered with sand. The litter is light. About 15 per cent of the total area is timberless. The average stand of timber in the timbered area is 2,300 feet per acre.

Classification of lands in T. 9 S., R. 10 E.

	Acres.
Total area	23,050
Timbered area	20,580
Burned area	50
Timberless area	2,420

Stand of timber species in T. 9 S., R. 10 E.

	Feet B. M.
Total	47,655,000
Yellow pine	45,272,250
White fir	2,382,750

Township 9 South, Range 11 East.

This township lies east of the divide in the Warm Springs Indian Reservation. Its surface is level; the soil sandy, with loose rock. The litter is very light. About 50 per cent of the total area of the township is timberless. The timber consists entirely of yellow pine, which, in the timbered area, has an average stand of 1,000 feet per acre.

Classification of lands and stand of timber in T. 9 S., R. 11 E.

	Acres.
Total area	22,822
Timbered area	11,862
Timberless area	10,960
	Feet B. M.
Total stand of timber, all yellow pine	11,862,000

Township 10 South, Range 5 East.

This township, lying west of the summit of the range and on the western edge of the reserve, has a rough mountainous surface with deep gorges cut by the North Fork of the Santiam, which traverses the State, and by Blowout Creek and other tribu-

A lightly forested area along the North Fork of the Santiam was an old burn, occurring at least fifty years ago. It is now well restocked with firs and cedars.

Chinquapin grows plentifully on the hillsides. The large "flat" drained by Boulder Creek supports a fine-looking forest. Although it is an excellent cover for snow storage, the growth is largely of small and limby trees, which will improve with time.

There is a shingle mill in section 18, having a capacity of 25,000 feet daily. It has culled some cedar from about 100 acres, but has not hurt the forest cover.

The average stand of timber in the timbered area is 10,500 feet per acre, of which 10 per cent is diseased.

In section 6 there has been some prospecting for mineral.

Classification of lands in T. 10 S., R. 6 E.

	Acres.
Total area	22,987
Timbered area	22,767
Burned area	220

Stand of timber species in T. 10 S., R. 6 E.

	Feet B. M.
Total	237,357,000
Sugar pine	2,373,570
White pine	11,867,850
Noble fir	4,747,140
Lovely fir	11,867,850
White fir	7,120,710
Red fir	154,282,050
Mertens hemlock	35,603,550
Red cedar	9,494,280

Township 10 South, Range 7 East.

This township lies west of the divide and is drained by the North Fork of the Santiam and its tributaries. The surface is high and broken, the soil rocky with very little bottom, and the litter medium.

Of the total area about 17 per cent is burnt, the large burn in the northeastern part of the township being about 100 years old. Portions of it, however, were burned again at the time of the Indian war in 1856, and even later. The last extensive burning of the young growth was in 1895. The areas of low stand near Peasleys and Pigeon Prairie have the appearance of very old burns, probably occurring one hundred and fifty years ago. They are now restocked with a very mixed forest of limby trees. The northeast quarter of the township would be good grazing land for stock.

The average stand of timber in the timbered area is 11,700 feet per acre. The proportion diseased is 10 per cent, being the most noticeable among the white pines.

Classification of land in T. 10 S., R. 7 E.

	Acres.
Total area	23,017
Timbered area	18,917
Burned area	4,100

Stand of timber species in T. 10 S., R. 7 E.

	Feet B. M.
Total	221,332,000
White pine	11,066,600
Noble fir	11,066,600
Lovely fir	17,706,560
White fir	11,066,600
Subalpine fir	6,639,960
Red fir	132,799,200
Mertens hemlock	22,133,200
Patton hemlock	4,426,640
Red cedar	4,426,640

Township 10 South, Range 8 East.

This township lies on the summit of the range, the eastern portion being in the Warm Springs Indian Reservation. It is drained to the westward by the South Fork of the Breitenbush and the Whitewater rivers. Its surface is high and abrupt, the elevation ranging from 5,000 to 10,000 feet. Mount Jefferson lies in the southeastern quarter of the township. The soil consists of rocky ledges and taluses. The litter is medium.

The high altitude and exposure forbid the growth of any extensive forests. Of the total area 37 per cent is burned and 19 per cent comprises rocks, glaciers, and snow. The big burn is the result of many small fires during the past hundred years, the most extensive being in the Whitewater Basin in 1856. A landslide on the north side of Permelia Lake carried all the timber standing thereon into the lake, which is choked with the débris. The average stand of timber in the timbered area is 3,900 feet per acre, of which 5 per cent is diseased.

Classification of lands in T. 10 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	9,690
Burned area	8,740
Timberless area	140
Glaciers and snow	4,470

Stand of timber species in T. 10 S., R. 8 E.

	Feet B. M.
Total	37,940,000
White pine	758,800
Noble fir	11,382,000
Lovely fir	3,794,000
Red fir	18,970,000
Mertens hemlock	1,897,000
Patton hemlock	758,800
Engelmann spruce	379,400

Township 10 South, Range 8½ East.

This fractional township, located within the Warm Springs Indian Reservation, lies upon the summit of the range, having a high, broken surface which is drained to the northeast by a glacial stream tributary to the Whitewater River. The soil consists of rock ledges and taluses; the litter is medium.

The average stand of timber in the timbered area is 1,000 feet per acre, of which 5 per cent is diseased.

Classification of lands in T. 10 S., R. 8½ E.

	Acres.
Total area	8,120
Timbered area	7,990
Glaciers and snow	130

Stand of timber species in T. 10 S., R. 8½ E.

	Feet B. M.
Total	7,990,000
Lovely fir	3,196,000
Subalpine fir	799,000
Patton hemlock	3,995,000

Township 10 South, Range 9 East.

This township, lying in the Warm Springs Indian Reservation and just east of the summit of the range, has a high, undulating surface and is crossed in the extreme northern part by the Whitewater River, flowing easterly. The soil consists mainly of rock with a thin covering of sand. The litter is light.

Seventeen per cent of the total area, situated in the central southern part of the township, is burned. The average stand of timber in the timbered area is 1,000 feet per acre.

Classification of lands in T. 10 S., R. 9 E.

	Acres.
Total area	23,050
Timbered area	19,090
Burned area	3,960

Stand of timber species in T. 10 S., R. 9 E.

	Feet B. M.
Total	19,090,000
Yellow pine	6,681,500
Lovely fir	3,818,000
White fir	2,863,500
Subalpine fir	954,500
Red fir	954,500
Patton hemlock	3,818,000

Township 10 South, Range 10 East.

This township lies east of the divide, its greater portion being in the Warm Springs Indian Reservation. Its surface consists of a high, broadly undulating plateau, which is drained to the southeastward by the Whitewater River joining the Metoluis River. The soil is composed of rock and sand. The litter is light.

The average stand of timber in the timbered area is 1,000 feet per acre.

Classification of lands in T. 10 S., R. 10 E.

	Acres.
Total timbered area	23,009

Stand of timber species in T. 10 S., R. 10 E.

	Feet B. M.
Total	23,009,000
Yellow pine	21,858,550
Red fir	1,150,450

Township 10 South, Range 11 East.

This township, lying in the Warm Springs Indian Reservation, is level, its surface being drained to the eastward by Sicseequa Creek. The soil is sandy, with loose rock, the litter very light.

About 30 per cent of the total area of the township is timberless, the timber consisting entirely of yellow pine, which in the timbered area has an average stand of 1,000 feet per acre.

Classification of lands and stand of timber in T. 10 S., R. 11 E.

	Acres.
Total area	23,014
Timbered area	16,154
Timberless area	6,860
	Feet B. M.
Total stand of timber, all yellow pine	16,154,000

Township 11 South, Range 5 East.

This township, lying west of the range and on the western edge of the reserve, has a high, undulating surface, with gorges cut by mountain streams. Across the

southern portion flows the Quartzville Fork of the Santiam River. The soil is composed of rock found loose and in ledges, and of sand. The litter is medium.

In this township the noble fir reaches a very high development. Trees 8 feet in diameter have been found, and individuals 5 feet in diameter are not uncommon. They always occur in mixed forest. The township is considered inaccessible for grazing. Scrub oak and chinquapin are found in section 6.

The average stand of timber in the timbered area is 13,600 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 11 S., R. 5 E.

	Acres.
Total area	23,220
Timbered area	22,780
Burned area	440

Stand of timber species in T. 11 S., R. 5 E.

	Feet B. M.
Total	317,180,000
Noble fir	31,718,000
Lovely fir	47,577,000
White fir	15,859,000
Red fir	158,590,000
Mertens hemlock	47,577,000
Patton hemlock	9,515,400
Red cedar	6,343,600

Township 11 South, Range 6 East.

This township lies west of the summit of the range. Its surface is high and mountainous, and is drained to the northward by Blowout Creek and branches of the North Fork of the Santiam. The soil is composed of rock and sand, the litter being medium.

A large burn in the eastern half of the township, comprising 35 per cent of the total area, is the result of several fires, the last of which occurred in 1892. The average stand of timber in the timbered area is 6,200 feet per acre, 10 per cent of which is diseased.

Classification of lands in T. 11 S., R. 6 E.

	Acres.
Total area	22,984
Timbered area	15,094
Burned area	7,890

A. BACHELOR AND COFFIN MOUNTAINS.

B. THICK MIXED FOREST OF RED AND YELLOW FIR.

Stand of timber specified in T. 11 S., R. 6 E.	Feet B. M.
Total	93,929,000
Noble fir	9,392,900
Lovely fir	18,785,800
White fir	9,392,900
Red fir	37,571,600
Mertens hemlock	9,392,900
Patton hemlock	8,453,610
Red cedar	939,290

Township 11 South, Range 7 East.

This township lies west of the summit of the range, having a high, broken, mountainous surface. It is drained by the North Fork of the Santiam, which flows northward throughout the township, and by the Marion Fork, which drains the southeastern part. The soil is rocky, with a thin covering of sand. The litter in sections 15, 16, and 21 is very heavy, but elsewhere generally light. The humus is heavy only in the old forests. In some of the recently burnt areas the soil is actually baked and all humus destroyed.

Several burns occur in the township, which affords an excellent opportunity to study ancient burns, together with those more recent, which have since been reforested. Some areas have been very recently destroyed.

Evidence is strong that a fine forest once covered this township, but all that now remains in dense stand is limited to two small patches, one in section 36 and the other in sections 29 and 21. The sizes and location of existing dead snags and stumps, all burned, indicate that several fires swept over this region. The lightly forested areas were burned more than fifty years ago, portions of them being reburned in 1870. The burn in section 36 occurred in 1896.

The region has always been a favorite hunting ground for deer.

The average stand of timber in the timbered area is 7,900 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 11 S., R. 7 E.	Acres.
Total area	22,984
Timbered area	19,064
Burned area	3,920

Stand of timber species in T. 11 S., R. 7 E.	Feet B. M.
Total	150,014,000
White pine	1,500,140
Lovely fir	30,002,800
Subalpine fir	1,500,140
Red fir	90,008,400
Mertens hemlock	15,001,400
Patton hemlock	7,500,700
Red cedar	4,500,420

Township 11 South, Range 8 East.

This township lies on the summit of the divide and its surface is too high and rough for good timber. Much of it is mountainous, with some portions undulating and open. It is drained to the westward by Grizzly Creek, Minto Creek, and a branch of Marion Fork. The soil is composed of rock, the litter being light.

About 30 per cent of the total area has been burned. Large tracts have been sheeped to such an extent that the wild forage grasses are almost exterminated, and the thin soil has been furrowed till it looks like sidehill plowing. The average stand of timber in the timbered area is 2,500 feet per acre. Of this 5 per cent is diseased.

Classification of lands in T. 11 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	16,080
Burned area	6,880
Timberless area	80

Stand of timber species in T. 11 S., R. 8 E.

	Feet B. M.
Total	39,250,000
White pine	1,177,500
Lodgepole pine	3,925,000
Noble fir	7,850,000
Lovely fir	7,850,000
White fir	1,962,500
Subalpine fir	3,925,000
Red fir	3,925,000
Mertens hemlock	785,000
Patton hemlock	7,850,000

Township 11 South, Range 8½ East.

This fractional township lies at an elevation of 5,000 feet just east of the summit of the range. It is a broadly undulating plateau drained to the eastward by Canyon Creek and its tributaries.

The average stand of timber in the timbered area is 1,000 feet per acre. The proportion diseased is 5 per cent.

Classification of lands in T. 11 S., R. 8½ E.

	Acres.
Total area	11,000
Timbered area	10,850
Burned area	150

Stand of timber species in T. 11 S., R. 8½ E.

	Feet B. M.
Total	10,850,000
Yellow pine	542,500
Lodgepole pine	1,085,000
White fir	542,500
Subalpine fir	4,340,000
Patton hemlock	4,340,000

TOWNSHIP 11 SOUTH, RANGE 9 EAST.

This township, lying east of the divide, is a high and broadly undulating plateau drained by Jefferson Creek and Metoluis River. The soil is sandy and rocky, the litter light.

In the northwest quarter a 3,000-acre tract is burned. The average stand of timber in the timbered area is 1,000 feet per acre.

Classification of lands in T. 11 S., R. 9 E.

	Acres.
Total area	22,425
Timbered area	19,355
Burned area	3,000
Timberless area	70

Stand of timber species in T. 11 S., R. 9 E.

	Feet B. M.
Total	19,355,000
Yellow pine	15,484,000
Lodgepole pine	967,750
White fir	967,750
Subalpine fir	967,750
Patton hemlock	967,750

TOWNSHIP 11 SOUTH, RANGE 10 EAST.

This township lies east of the summit of the range. Its surface is a high, undulating plateau, drained to the eastward by the Metoluis River. The soil is sandy with loose rock, the litter very light. A burn occurs in the western half of the township. The average stand of timber in the timbered area is 1,000 feet per acre. The timber consists entirely of yellow pine.

Classification of lands and stand of timber in T. 11 S., R. 10 E.

	Acres.
Total area	22,500
Timbered area	20,640
Burned area	1,550
Timberless area	310
	Feet B M.
Total stand of timber, all yellow pine	20,640,000

Township 11 South, Range 11 East.

This township lies on the eastern edge of the reserve. It is generally level, undulating somewhat in the southwestern portion. The soil is composed of sand and loose rocks, the litter being very light.

Of the total area 50 per cent is timberless. The timber consists entirely of yellow pine, the average stand in the timbered area being 1,000 feet per acre.

Classification of lands and stand of timber in T. 11 S., R. 11 E.

	Acres.
Total area	22,500
Timbered area	11,170
Timberless area	11,330
	Feet B. M.
Total stand of timber, all yellow pine	11,170,000

Township 12 South, Range 5 East.

This township lies west of the divide and on the western edge of the reserve. It is a high, undulating mountain plateau with natural parks upon which grow wild clover and timothy, furnishing excellent grazing. It is drained by the Middle Fork of the Santiam which flows across the State in a westerly direction. The soil is rocky and sandy, the litter medium. Several burns exist, but on the whole the township is timbered, the average stand in the timbered area being 10,700 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 12 S., R. 5 E.

	Acres.
Total area	24,713
Timbered area	22,683
Burned area	2,030

Stand of timber species in T. 12 S., R. 5 E.

	Feet B. M.
Total	243,138,000
White pine	2,431,380
Noble fir	36,470,700
Lovely fir	36,470,700
White fir	4,862,760
Red fir	121,569,000
Mertens hemlock	24,313,800
Patton hemlock	12,156,900
Red cedar	4,862,760

Township 12 South, Range 6 East.

This township, lying west of the summit of the range, is a high, undulating, mountain plateau. Its surface is drained by Pyramid Creek, Scar Creek, other branches of the Middle Fork of the Santiam, and by Straight Creek. Excellent grazing is found on the high natural parks which support wild clover and timothy. The soil is rocky, the litter light.

The average stand of timber in the timbered area is 6,700 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 12 S., R. 6 E.

	Acres.
Total area	24,928
Timbered area	21,908
Burned area	2,500
Timberless area	520

Stand of timber species in T. 12 S., R. 6 E.

	Feet B. M.
Total	146,673,000
White pine	1,466,730
Noble fir	29,334,600
Lovely fir	36,668,250
Red fir	51,335,550
Mertens hemlock	11,733,840
Patton hemlock	8,800,380
Engelmann spruce	7,333,650

Township 12 South, Range 7 East.

This township lies west of the summit and its high surface is broadly undulating. The North Fork of the Santiam flows northerly across the western portion of the township. The soil is rocky and gravelly, with black muck in the mountain meadows, which are situated in sections 28 and 11.

Along the eastern edge of the township considerable land is burned, the result of several fires, the last of which was in 1894. The lightly forested regions appear to be the restocking of a burn that occurred over ninety years ago. The average stand of timber in the timbered area is 4,300 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 12 S., R. 7 E.

	Acres.
Total area	24,960
Timbered area	21,720
Burned area	2,310
Timberless area	930

Stand of timber species in T. 12 S., R. 7 E.

	Feet B. M.
Total	92,905,000
White pine	1,858,100
Lodgepole pine	9,290,500
Noble fir	9,290,500
Lovely fir	18,581,000
White fir	4,645,250
Red fir	37,162,000
Mertens hemlock	6,503,350
Patton hemlock	929,050
Engelmann spruce	4,645,250

Township 12 South, Range 8 East.

This township lies upon the summit of the plateau. It has a high, undulating surface. It is drained by mountain streams flowing into and from Marion Lake. The soil consists of rock ledges and bowlders covered with a thin layer of sand. The litter is light.

The timber of the township has an alpine aspect, being very limby with short or no clear trunks. About 30 per cent of the total area is burned, timberless, or composed of snow and glaciers. The burn southwest of Marion Lake is the result of several fires, the last of which occurred in 1894. The average stand of timber in the timbered area is 1,700 feet per acre. The proportion diseased is 2 per cent.

Classification of lands in T. 12 S., R. 8 E.

	Acres.
Total area	24,770
Timbered area	17,180
Burned area	4,900
Timberless area	1,600
Glaciers and snow	1,090

Stand of timber species in T. 12 S., R. 8 E.

	Feet B. M.
Total	29,305,000
Lodgepole pine	2,930,500
Noble fir	2,930,500
Lovely fir	4,395,750
White fir	4,395,750
Subalpine fir	5,274,900
Red fir	2,930,500
Mertens hemlock	586,100
Patton hemlock	4,395,750
Engelmann spruce	1,465,250

A. THICK YOUNG MIXED FOREST OF RED FIR.

B. MIXED FOREST OF YELLOW FIR.

Township 12 South, Range 8½ East.

This fractional township lies upon the summit of the plateau and has a high, undulating surface drained to the eastward by Canyon Creek and its tributaries.

The average stand of timber in the timbered area is 1,000 feet per acre, of which 5 per cent is diseased.

Classification of lands in T. 12 S., R. 8½ E.

	Acres.
Total timbered area	14,400

Stand of timber species in T. 12 S., R. 8½ E.

	Feet B. M.
Total	14,400,000
Yellow pine	720,000
Noble fir	1,440,000
Lovely fir	2,880,000
White fir	2,880,000
Subalpine fir	2,880,000
Patton hemlock	2,880,000
Engelman spruce	720,000

Township 12 South, Range 9 East.

This township lies east of the summit and on the eastern edge of the reserve. Its surface is high and broadly undulating in the eastern part, and lower in the western portion. The soil is good, consisting of sand with some loose rocks. The litter is light. About 5,000 acres are arable, this land lying in the low flats west of the Metoluis River, which crosses the township in a northerly direction, and with its tributaries drains the surface.

The average stand of timber in the timbered area is 2,600 feet per acre, 5 per cent of which is diseased.

Classification of lands in T. 12 S., R. 9 E.

	Acres.
Total timbered area	23,128

Stand of timber species in T. 12 S., R. 9 E.

	Feet B. M.
Total	59,303,000
Yellow pine	53,372,700
White fir	2,965,150
Tamarack	2,965,150

Township 13 South, Range 5 East.

This township lies west of the summit and on the western border of the reserve. Its surface is rough and broken with steep ridges and deep gorges cut by the Middle Fork of the Santiam, which flows nearly across the extreme eastern part of the

township in a northerly direction, and by the South Fork of the Santiam, Soda Fork, Hemlock Creek, and their branches. The soil is rocky and sandy. The litter is heavy in the central part of the township and medium elsewhere. The humus is generally heavy.

The burns in the southern half of the township occurred in 1867 and were very severe. Several smaller fires have since destroyed the restocking, that in 1896 being the most destructive. The restocking is almost entirely red fir, and gives promise of a fine forest for future supply. The average stand of timber in the timbered area is 20,000 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 13 S., R. 5 E.

	Acres.
Total area	22,833
Timbered area	19,933
Burned area	2,900

Stand of timber species in T. 13 S., R. 5 E.

	Feet B. M.
Total	396,235,500
Noble fir	19,811,775
Lovely fir	39,623,550
White fir	11,887,065
Red fir	257,553,075
Mertens hemlock	59,435,325
Red cedar	7,924,710

Township 13 South, Range 6 East.

This township lies west of the summit of the range and is drained by Fish Lake Creek, which traverses the southern portion of the township in an easterly direction, and by tributaries of Lava Creek and of the Middle Fork of the Santiam. Its surface is high and undulating, with open regions affording grazing. The burned summits and some of the more open forested areas have been over sheeped. The soil is composed of rock, gravel, and sand. The litter is medium.

About 25 per cent of the total area is burned, the big burns being "clear burns," excepting in a few small areas where standing snags would indicate that the former forest was a thick stand of the alpine species. Probably the date was that of the destructive fires of 1867.

Indian Prairie in section 31 and Lost Prairie in section 27 are favorite camping places for hunting and fishing parties. They are the result of very small fires, mainly in the underbrush, only a few trees being burned.

The average stand of timber in the timbered area is 14,100 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 13 S., R. 6 E.

	Acres.
Total area	23,012
Timbered area	17,172
Burned area	5,640
Timberless area	200

Stand of timber species in T. 13 S., R. 6 E.

	Feet B. M.
Total	243,807,000
White pine	4,876,140
Noble fir	24,380,700
Lovely fir	24,380,700
White fir	12,190,350
Subalpine fir	4,876,140
Red fir	146,284,200
Mertens hemlock	24,380,700
Engelmann spruce	2,438,070

Township 13 South, Range 7 East.

This township lies west of the summit of the range and is drained in the western part by Lava Creek. The surface is high and broadly undulating in the west, the eastern half being a more level and openly forested region floored with lava. The soil is mostly lava flow mingled with sand. The litter is light. The small timberless areas are cinder cones having distinct craters.

Lava Lake is properly a meadow. Lava Creek flows into this meadow, but sinks before reaching the lower end, and probably continues south and enters Clear Lake in T. 14 S., R. 7 E. The meadow is covered with wild hay, affording good pasturage for stock.

Fish Lake is a pleasure resort for fishermen and camping parties. It is dry in the fall, the bed of the lake supporting a good growth of wild hay.

The lightly forested area in the eastern half of the township is largely covered by a great lava flow, which seems to have come from a fissure to the southward of Three-fingered Jack. In the southeastern part of the township this is partly covered with loose sand supporting a poor growth of the alpine species.

The average stand of timber in the timbered area is 7,100 feet per acre, of which 5 per cent is diseased.

Classification of lands in T. 13 S., R. 7 E.

	Acres.
Total area	23,020
Timbered area	21,070
Burned area	760
Timberless area	1,190

Stand of timber species in T. 13 S., R. 7 E.

	Feet B. M.
Total	50,030,000
Yellow pine	3,004,200
White pine	3,004,200
Lodgepole pine	3,004,200
Noble fir	3,004,200
Lovely fir	15,021,000
White fir	15,021,000
Subalpine fir	1,502,100
Red fir	90,126,000
Mertens hemlock	15,021,000
Patton hemlock	1,502,100

Township 13 South, Range 7½ East.

This fractional township lying upon the summit of the range has a broadly undulating surface, the soil being composed of lava flows and loose sand. The litter is light. Mountain streams drain its surface.

Over 40 per cent of the total area is burned. The average stand of timber in the timbered area is 300 feet per acre.

Classification of lands in T. 13 S., R. 7½ E.

	Acres.
Total area	14,560
Timbered area	7,380
Burned area	6,310
Timberless area	550
Glaciers and snow	320

Stand of timber species in T. 13 S., R. 7½ E.

	Feet B. M.
Total	2,000,000
Yellow pine	200,000
White pine	100,000
Lodgepole pine	800,000
Lovely fir	200,000
White fir	200,000
Subalpine fir	200,000
Patton hemlock	300,000

Township 13 South, Range 8 East.

This township lies partly upon and partly east of the summit of the range. Fish Creek and tributaries drain it to the eastward. The surface is broadly undulating. The soil is composed of rock, gravel, cinders, and sand. The litter is light.

Blue Lake has the appearance of being very deep. It bears evidence of being an old crater, the immediate surrounding topography being abrupt and the shores,

A. VIEW FROM MINTO MOUNTAIN.

B. VIEW FROM CONE PEAK, LOOKING EAST.

together with the area between it and Suttles Lake, being covered with volcanic ash and rocks.

Nearly 30 per cent of the total area is burned. The average stand of timber in the timbered area is 1,600 feet per acre, of which the proportion diseased is 5 per cent.

Classification of lands in T. 13 S., R. 8 E.

	Acres.
Total area	23,171
Timbered area	16,121
Burned area	6,490
Timberless area	560

Stand of timber species in T. 13 S., R. 8 E.

	Feet B. M.
Total	24,771,000
Yellow pine	9,908,400
Lodgepole pine	7,431,300
Lovely fir	1,238,550
White fir	1,238,550
Subalpine fir	1,238,550
Patton hemlock	3,715,650

Township 13 South, Range 9 East.

This township lies east of the summit and on the eastern border of the reserve. It is drained by the Metoluis River, First Creek, and Lake Creek. The surface is high and rolling. The soil is rich and sandy, containing some gravel. The litter is light.

There are 10,000 acres of arable land lying north and northwest of Black Butte, which is situated in the southeast quarter of the township. The exact limits and area would be determined by an irrigation survey to take water from Lake Creek. Several small private irrigating ditches have been constructed by the settlers. Hay is cultivated in small areas.

The size and flow of the Metoluis River is astonishing. The main stream heads in large springs on the north side of Black Butte and is joined 2 miles below by Lake Creek, a much smaller stream. Near the center of section 3 the sectional area of the stream was 123.27 square feet and the average velocity 3.308 feet per second. The surface width was 38 feet and the maximum depth 8 feet. The flow was 3,050 gallons per second.

The average stand of timber in the timbered area is 2,500 feet per acre.

Classification of lands in T. 13 S., R. 9 E.

	Acres.
Total area	23,032
Timbered area	22,092
Burned area	580
Logged area	360

Stand of timber species in T. 13 S., R. 9 E.

	Feet B. M.
Total	54,417,000
Yellow pine	52,784,490
White fir	544,170
Larch	1,088,340

Township 14 South, Range 5 East.

This township lies west of the summit and on the western edge of the reserve. It is drained to the northwestward by the South Fork of the Santiam River and its branches, and to the south by the Blue River and its tributaries. The surface consists of high ridges and deep gorges, and the summits of the high plateaus are bare. The latter are sheeped clean annually. The soil is rocky and sandy, the litter medium. In flood seasons the Santiam River is drivable from the west boundary of the township.

About 35 per cent of the total area is burned. The burn in sections 13 and 24 is very old and was an Indian hunting ground. The burn in section 12 and part of section 13 occurred in 1896. That in sections 1, 2, 3, and 4 occurred in 1885, and again in 1897.

The heavy timber in section 5 is old growth but not first class, being sometimes limby and windshaken. The proportion of poor timber is about 10 per cent. Although the timbered areas were saved from the big burn, the trunks were scorched to a height of 20 feet or more, showing that fire ran through the underbrush but failed to ignite the timber.

The average stand of timber in the timbered area is 14,900 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 14 S., R. 5 E.

	Acres.
Total area	22,744
Timbered area	14,674
Burned area	8,070

Stand of timber species in T. 14 S., R. 5 E.

	Feet B. M.
Total	217,859,000
White pine	6,535,770
Noble fir	21,785,900
Lovely fir	32,678,850
White fir	10,892,950
Subalpine fir	10,892,950
Red fir	87,143,600
Mertens hemlock	21,785,900
Patton hemlock	21,785,900
Red cedar	4,357,180

Stand of timber species in T. 14 S., R., 7 E.

	Feet B. M.
Total	50,030,000
Lodgepole pine	5,003,000
Lovely fir	2,501,500
White fir	1,000,600
Red fir	30,018,000
Mertens hemlock	5,003,000
Patton hemlock	2,501,500

Township 14 South, Range 7½ East.

This fractional township lies on the summit of the range. The surface is high and broadly undulating, the soil consisting of lava and loose sand. The litter is very light.

The burned area comprises 33 per cent. The average stand of timber in the timbered area is 200 feet per acre.

Classification of lands in T. 14 S., R. 7½ E.

	Acres.
Total area	15,640
Timbered area	9,120
Burned area	5,110
Timberless area	250
Glaciers and snow	1,160

Stand of timber species in T. 14 S., R. 7½ E.

	Feet B. M.
Total	2,000,000
Yellow pine	40,000
White pine	20,000
Lodgepole pine	700,000
Lovely fir	40,000
Subalpine fir	400,000
Patton hemlock	400,000

Township 14 South, Range 8 East.

This township lies just east of the divide and is drained by Cache Creek and Dry Creek, which flow in a northeasterly direction and sink in sections 14 and 13, respectively. The surface is a high, broadly undulating plateau. The soil is very sandy, with occasional small lava flows. The litter is very light. Experiments in irrigation on a small scale have proved successful.

The greater portion of the township is lightly forested, the average stand in the timbered area being 1,900 feet per acre. The proportion diseased is 5 per cent.

A. MOUNT WASHINGTON.

B. EDGE OF GREAT LAVA FLOW IN T. 15 S., R. 8 E.

Classification of lands in T. 14 S., R. 8 E.

	Acres.
Total area	22,741
Timbered area	21,401
Burned area	920
Timberless area	260
Glaciers and snow	160

Stand of timber species in T. 14 S., R. 8 E.

	Feet B. M.
Total	40,911,000
Yellow pine	22,501,050
Lodgepole pine	4,091,100
White fir	818,220
Subalpine fir	4,091,100
Red fir	1,227,330
Patton hemlock	8,182,200

Township 14 South, Range 9 East.

This township lies east of the summit and upon the eastern border of the reserve. Its high surface is level or rolling. The soil consists of sand and gravel, the litter being light. It is semiarid, and if cleared and reclaimed by irrigation would be cultivable. At present all of the waters of Squaw Creek lying to the south are appropriated, and Trout Creek, in the adjoining township, does not offer a large supply. In sections 9 and 10 wild hay is found in the meadows.

The average stand of timber in the timbered area is 3,200 feet per acre, of which 5 per cent is diseased.

Classification of lands in T. 14 S., R. 9 E.

	Acres.
Total area	22,945
Timbered area	22,115
Timberless area	830

Stand of timber species in T. 14 S., R. 9 E.

	Feet B. M.
Total	71,115,000
Yellow pine	68,981,550
White fir	1,422,300
Tamarack	711,150

Township 15 South, Range 5 East.

This township, lying on the western border of the reserve and well west of the summit, is drained by Blue River, which traverses it in a southeasterly direction. The surface is a high, undulating mountain plateau, the gorges being cut by mountain streams. The soil is rocky and sandy; the litter medium.

The average stand of timber in the timbered area is 6,100 feet per acre. The proportion diseased is 10 per cent.

Classification of lands in T. 15 S., R. 5 E.

	Acres.
Total area	26,000
Timbered area	24,920
Burned area	1,080

Stand of timber species in T. 15 S., R. 5. E.

	Feet B. M.
Total	151,175,000
Noble fir	22,676,250
Lovely fir	15,117,500
White fir	7,558,750
Red fir	90,705,000
Mertens hemlock	15,117,500

Township 15 South, Range 6 East.

This township lies west of the summit of the range and is drained to the southward and southeastward by the McKenzie River, which traverses the township and its tributaries. The surface is high and mountainous, with steep ridges. The lightly forested slopes are sheeped every season. The soil is rocky; the litter medium.

The average stand of timber in the timbered area is 3,800 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 15 S., R. 6 E.

	Acres.
Total area	26,900
Timbered area	25,410
Burned area	1,490

Stand of timber species in T. 15 S., R. 6 E.

	Feet B. M.
Total	95,345,000
Lovely fir	19,069,000
White fir	4,767,250
Subalpine fir	9,534,500
Red fir	38,138,000
Mertens hemlock	7,627,600
Patton hemlock	9,534,500
Red cedar	1,906,900
Incense cedar	4,767,250

Township 15 South, Range 7 East.

This township lies west of the divide. It has a high, broadly undulating surface, with soil consisting of lava rock and sand. The litter is light.

The average stand of timber in the timbered area is only 400 feet per acre, of which 2 per cent is diseased.

Classification of lands in T. 15 S., R. 7 E.

	Acres.
Total area	26,000
Timbered area	24,810
Burned area	940
Timberless area	250

Stand of timber species in T. 15 S., R. 7 E.

	Feet B. M.
Total	8,775,000
Lodgepole pine	7,897,500
Subalpine fir	175,500
Red fir	438,750
Patton hemlock	263,250

TOWNSHIP 15 SOUTH, RANGE 7½ EAST.

This fractional township lies practically upon the summit of the range, having a high, broadly undulating surface. The soil consists of lava flows and sand. The litter is very light.

The average stand of timber in the timbered area is only 200 feet per acre.

Classification of lands in T. 15 S., R. 7½ E.

	Acres.
Total area	16,000
Timbered area	13,430
Burned area	2,230
Timberless area	120
Glaciers and snow	220

Stand of timber species in T. 15 S., R. 7½ E.

	Feet B. M.
Total	3,000,000
Lodgepole pine	2,550,000
White fir	150,000
Subalpine fir	150,000
Patton hemlock	150,000

TOWNSHIP 15 SOUTH, RANGE 8 EAST.

This township lies upon the summit of the plateau. It has a high, rolling surface. The soil consists of lava flows and sand. The litter is very light.

The average stand of timber in the timbered area is only 200 feet per acre.

Classification of lands in T. 15 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	19,830
Burned area	3,050
Timberless area	60
Glaciers and snow	100

Stand of timber species in T. 15 S., R. 8 E.

	Feet B. M.
Total	4,000,000
Yellow pine	2,600,000
Lodgepole pine	1,200,000
White fir	200,000

Township 15 South, Range 9 East.

This township lies east of the summit, on the eastern edge of the reserve. Its surface is a high, undulating or level plateau, drained by Trout Creek and Squaw Creek. The soil is composed of sand, rock, and gravel. The litter is light.

The average stand of timber in the timbered area is 2,800 feet per acre, 5 per cent of which is diseased.

Classification of lands in T. 15 S., R. 9 E.

	Acres.
Total timbered area	22,978

Stand of timber species in T. 15 S., R. 9 E.

	Feet B. M.
Total	65,278,000
Yellow pine	62,014,100
White fir	1,305,560
Tamarack	1,958,340

Township 16 South, Range 5 East.

This township lies west of the summit and on the western border of the reserve, and is traversed by McKenzie River, flowing in a westerly direction. The surface is broken with steep ridges alternating with deep canyons cut by mountain streams. The high slopes would be fair grazing were they not almost inaccessible. The soil consists of rocky hillsides with some good bottom. The litter is medium. About 1,000 acres are arable, and a very small area has been under cultivation.

The lightly forested areas were evidently burned about sixty years ago. In section 18 about 200,000 feet of lumber has been culled from the standing forest and cut by a portable mill for local consumption. The average stand of timber in the timbered area is 10,100 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 16 S., R. 5 E.

	Acres.
Total area	23,040
Timbered area	21,690
Burned area	1,350

Stand of timber species in T. 16 S., R. 5 E.

	Feet B. M.
Total	218,010,000
Lovely fir	6,540,300
White fir	15,260,700
Red fir	152,607,000
Mertens hemlock	17,440,800
Patton hemlock	4,360,200
Red cedar	10,900,500
Incense cedar	10,900,500

Township 16 South, Range 6 East.

This township lies west of the summit of the range, and is drained to the westward by the McKenzie River and its tributaries. Its surface is rough and steep in the northern and southern portions, and more undulating in the central part. The soil is rocky and sandy, the litter medium and light.

Belknap Hot Springs, in sections 11 and 12, have a temperature of 188°. Foley Hot Springs are located in section 28.

The average stand of timber in the timbered area is 13,400 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 16 S., R. 6 E.

	Acres.
Total area	23,040
Timbered area	22,660
Burned area	380

Stand of timber species in T. 16 S., R. 6 E.

	Feet B. M.
Total	303,450,000
Lovely fir	9,103,500
White fir	15,172,500
Red fir	227,587,500
Mertens hemlock	21,241,500
Red cedar	15,172,500
Incense cedar	15,172,500

Township 16 South, Range 7 East.

This township lies west of the summit, having a high, steep surface. The soil is rocky and sandy, the litter light.

About 18 per cent of the total area is burned. The average stand of timber in the timbered area is 2,200 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 16 S., R. 7 E.

	Acres.
Total area	23,054
Timbered area	4,200
Timberless area	120

Stand of timber species in T. 16 S., R. 7 E.

	Feet B. M.
Total	41,549,000
Lodgepole pine	830,980
Lovely fir	4,154,900
White fir	6,232,350
Subalpine fir	2,077,450
Red fir	20,774,500
Mertens hemlock	2,492,940
Patton hemlock	4,154,900
Red cedar	830,980

Township 16 South, Range 7½ East.

This fractional township lies west of the summit and is drained by White Branch and other small streams. The surface is high, rocky, and undulating, the soil consisting of lava and bowlders. The litter is light.

The average stand of timber in the timbered area is 250 feet per acre.

Classification of lands in T. 16 S., R. 7½ E.

	Acres.
Total area	15,930
Timbered area	15,480
Burned area	120
Timberless area	70
Glaciers and snow	260

Stand of timber species in T. 16 S., R. 7½ E.

	Feet B. M.
Total	4,000,000
Lodgepole pine	2,800,000
Lovely fir	400,000
White fir	400,000
Patton hemlock	400,000

Township 16 South, Range 8 East.

This township lies on the summit of the plateau, reaching an elevation of 10,000 feet. It is drained by Squaw Creek and White Branch, both glacial streams. The surface is very high, steep, and mountainous, over 35 per cent consisting of snow and glaciers.

The average stand of timber in the timbered area is 225 feet per acre.

Classification of lands in T. 16 S., R. 8 E.

	Acres.
Total area	21,228
Timbered area	13,518
Glaciers and snow	7,710

Stand of timber species in T. 16 S., R. 8 E.

	Feet B. M.
Total	3,000,000
Yellow pine	150,000
Lodgepole pine	1,800,000
White fir	150,000
Subalpine fir	450,000
Patton hemlock	450,000

Township 16 South, Range 9 East.

This township lies east of the divide and on the eastern border of the reserve. The surface is high and undulating, drained to the northeastward by Squaw Creek and tributary streams. The soil is rocky and sandy, the litter light. The waters of Squaw Creek are used for the irrigation of about 1,500 acres of sandy land in T. 15 S., R. 10 E., lying just east of the reserve. The principal crop is hay.

The average stand of timber in the timbered area is 3,200 feet per acre.

Classification of lands in T. 16 S., R. 9 E.

	Acres.
Total area	21,228
Timbered area	21,058
Timberless area	170

Stand of timber species in T. 16 S., R. 9 E.

	Feet B. M.
Total	68,308,000
Yellow pine	61,477,200
Lodgepole pine	3,415,400
White fir	2,049,240
Tamarack	1,366,160

Township 17 South, Range 5 East.

This fractional township lies west of the summit and on the western border of the reserve. It is an undulating mountain plateau, drained to the northwestward by the South Fork of the McKenzie River. The soil consists of rock, gravel, and sand. The litter is light or medium.

The average stand of timber in the timbered area is 5,500 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 17 S., R. 5 E.

	Acres.
Total area	18,360
Timbered area	17,730
Burned area	630

Stand of timber species in T. 17 S., R. 5 E.

	Feet B. M.
Total	96,365,000
Noble fir	4,818,250
Lovely fir	9,636,500
White fir	4,818,250
Subalpine fir	4,818,250
Red fir	57,819,000
Mertens hemlock	5,781,900
Patton hemlock	5,781,900
Red cedar	2,890,950

Township 17 South, Range 6 East.

This fractional township lies west of the summit of the range, having a high undulating surface, drained by tributaries to the McKenzie River. The soil is rocky, the litter light.

The average stand of timber in the timbered area is 1,600 feet per acre, of which 10 per cent is diseased.

Classification of lands in T. 17 S., R. 6 E.

	Acres.
Total area	18,360
Burned area	120
Timbered area	18,240

Stand of timber species in T. 17 S., R. 6 E.

	Feet B. M.
Total	28,355,000
Noble fir	1,134,200
Lovely fir	4,253,250
White fir	2,835,500
Subalpine fir	4,253,250
Red fir	11,342,000
Mertens hemlock	1,417,750
Patton hemlock	2,835,500
Red cedar	283,550

Township 17 South, Range 7 East.

This fractional township lies west of the summit of the range, and is drained to the northwestward by Horse Creek and other tributaries to the McKenzie River. The surface is high and undulating, the soil rocky, the litter light.

The average stand of timber in the timbered area is 1,000 feet per acre, of which 5 per cent is diseased.

Classification of lands in T. 17 S., R. 7 E.

	Acres.
Total timbered area	18,370

A. FOREST OF YELLOW PINE.

B. MIXED FOREST OF RED FIR.

Stand of timber species in T. 17 S., R. 7 E.

	Feet B. M.
Total	18,370,000
Lovely fir	3,674,000
White fir	1,837,000
Subalpine fir	3,674,000
Red fir	5,511,000
Patton hemlock	3,674,000

Township 17 South, Range 7½ East.

This fractional township lies west of the summit, its high, undulating surface reaching an elevation of 7,000 to 8,000 feet. Horse Creek drains the western portion. The soil is composed of rock ledges and sand. The litter is very light.

The average stand of timber in the timbered area is 250 feet per acre.

Classification of lands in T. 17 S., R. 7½ E.

	Acres.
Total area	12,000
Timbered area	11,620
Timberless area	60
Glaciers and snow	320

Stand of timber species in T. 17 S., R. 7½ E.

	Feet B. M.
Total	3,000,000
Lodgepole pine	600,000
Lovely fir	600,000
White fir	300,000
Subalpine fir	600,000
Patton hemlock	900,000

Township 17 South, Range 8 East.

This township lies on the summit of the range, its elevation ranging from 7,000 to 9,000 feet. The surface is high and rough, 36 per cent being composed of snow and glaciers. The soil is composed of ledges of rock, the litter being very light.

The average stand of timber in the timbered area is 200 feet per acre.

Classification of lands in T. 17 S., R. 8 E.

	Acres.
Total area	23,040
Timbered area	14,670
Timberless area	50
Glaciers and snow	8,320

Stand of timber species in T. 17 S., R. 8 E.

	Feet B. M.
Total	3,000,000
Lodgepole pine	600,000
Lovely fir	600,000
White fir	300,000
Subalpine fir	600,000
Patton hemlock	900,000

Township 17 South, Range 9 East.

This township lies just east of the summit and on the eastern border of the reserve. It is drained to the northeastward by Three Creek and to the southeastward by Large Creek. The surface is high and broadly undulating. The soil is composed of rock ledges, bowlders, and sand. The litter is light.

The average stand of timber in the timbered area is 1,500 feet per acre.

Classification of lands in T. 17 S., R. 9 E.

	Acres.
Total area	22,876
Timbered area	22,276
Timberless area	120
Glaciers and snow	480

Stand of timber species in T. 17 S., R. 9 E.

	Feet B. M.
Total	32,826,000
Yellow pine	9,847,800
Lovely fir	3,282,600
White fir	6,565,200
Subalpine fir	6,565,200
Patton hemlock	6,565,200

A. FISH LAKE, LOOKING SOUTHWEST.

B. VIEW FROM CONE PEAK, LOOKING SOUTH.

CASCADE RANGE FOREST RESERVE, BETWEEN TOWNSHIPS 18 AND 29 SOUTH.

By Arthur Dodwell and Theodore F. Rixon.

AREA EXAMINED.

The area examined has the following boundaries: Commencing at the northwest corner of T. 20 S., R. 1 E., thence east 6 miles; thence north 12 miles to the northwest corner of T. 18 S., R. 2 E.; thence easterly along the township line between townships 17 and 18 to the northeast corner of T. 18 S., R. 9 E.; thence south 36 miles; thence westerly 18 miles; thence south to the southeast corner of T. 27 S., R. 6½ E.; thence west to the northeast corner of T. 28 S., R. 4 E.; thence south 6 miles; thence west 12 miles; thence south 6 miles; thence west 12 miles to the southwest corner of T. 29 S., R. 1 E.; thence following north the Willamette meridian to point of beginning. The area embraces about 3,272 square miles and contains within its boundaries portions of Lane, Douglas, Crook, and Klamath counties, the two latter lying wholly on the east side of the Cascade Range.

The area on the west slope of the Cascade Range is drained by five main rivers and their tributaries, viz: The McKenzie flowing to the north; the Middle Fork of the Willamette, the North and South forks of the Umpqua discharging their waters to the west, and the Rogue River to the south. On the eastern slope it is wholly drained by the Deschutes River and its tributaries, with the exception of the extreme southeasterly corner, which drains into the Klamath country.

The Middle Fork of the Willamette drains by far the larger area on the west, having for its tributaries several large streams which have their source in the Cascade Mountains, the principal of which are the North Fork, Salmon, Salt, Trout, Glacier, Coal, and the South Fork. The principal feeders of the North Fork of the Umpqua are McKinley, Steamboat, Fish Creek, and Diamond Lake, which drains the territory immediately north of Crater Lake, Mount Bailey, and portions of Mount Thielsen. The North Fork of the South Fork of the Umpqua River is not a very large stream, but drains a rugged and abrupt territory, and has numerous spring brooks for feeders.

The Rogue River is just included within the boundary of the reserve examined, and drains only a small portion of the reserve.

LAKES.

The Deschutes River, on the east side of the reserve, drains a large territory, and is fed from numerous lakes which drain the adjacent mountains, and, retaining the water, act as feeders and reservoirs, which eventually will become utilized by large irrigation plants which will fertilize the land lying to the east of the Cascades, which is only waiting the advent of water to become the center of a thriving agricultural community.

The principal lakes on the east side are Trout, Deer, Davis, Odell, Crescent, Summit, and Fish lakes. Of these the only lake that is barren of fish is Summit. The peculiar feature in regard to Odell and Davis is the fact that the Deschutes River at the outlet of Davis Lake sinks and does not reappear for several miles, yet the fish work up the river through the underground passage and find their way into these lakes every season during the spawning time, thus demonstrating the existence of a large subterranean passage.

The only lake on the west side of any prominence is Waldo, the source of the North Fork of the Middle Fork of the Willamette. This is a large and deep body of water, free from fish on account of the fall at its mouth, which effectually stops their further progress. This lake lies practically upon the summit of the Cascade Range, and with little difficulty could be drained into Salmon Creek, there being only a narrow rim 15 feet high between them. This lake can be used as a reservoir for the storage of water for irrigation works east of the mountains. It would require the excavation of a tunnel a little over 1 mile long into the head waters of Salt Creek, and thence it could be conveyed by ditches around the east side of Salt Creek, crossing the main Cascade divide at the extreme western end of Odell Lake, whence it could be emptied into Lake Odell or conveyed by independent ditches and flumes to the objective point.

AGRICULTURE.

Very little agriculture is carried on within the confines of the territory examined, for the land is scattered in small tracts and is distant from markets. If it were not for the few cattle that the settlers graze upon the high mountains they could not possibly make an existence. The only settlement of any size is that on Big Prairie, at the junction of the North Fork and Middle Fork of the Willamette, and the settlers here rely principally upon cattle for a living, using the ground mostly for raising hay for their stock, although a few acres of oats and wheat had been planted and raised upon the prairie. There is another settlement at Hazel Dell post-office, and again at the mouth of Trout Creek, and 2 miles above it on the main river on Trout Creek there are two settlers, one of whom makes his living from the hot springs upon his place, which are generously patronized during the summer months.

BELKNAP CRATER.

There is another settler farther up the main river upon the ranch commonly called Rigdon's, in sec. 16, T. 24 S., R. 4 E. The man makes his living by cutting hay and furnishing accommodations for passengers going from one side of the mountain to the other during the summer, but during the winter the place is deserted. On the North Fork of the Umpqua there is only one settler, located near the mouth of Fish Creek, and he relies entirely upon his gun and a few head of cattle for his existence.

The next settlement of any note was made on Fall Creek, in T. 18 S., R. 2 E., but for some years has been abandoned, the improvements having all grown up with brush and the houses fallen down. These claims were evidently taken up for their timber in years past.

On the east side of the mountains there is a considerable area of desert land that could be made a fine producing country as soon as water can be conveyed to the lands, and as there are numerous reservoirs, in the shape of lakes, little difficulty should be had in making this territory a fine farming country. All that is lacking is the necessary capital wherewith to commence operations.

ROADS AND TRAILS.

There is only one main road through the reserve, and that follows the north bank of the Middle Fork of the Willamette and is the site of the first trail used by the early settlers when they came to the Pacific coast from the Eastern States. It is kept in fairly good condition, and during the time that the summit of the Cascades is free from snow it is a great highway for trains going and coming from eastern to western Oregon and is much used by excursionists on their fishing and hunting trips.

From this road numerous trails penetrate the surrounding country, used principally by cattle and sheep men in driving their flocks to and from the grazing limits. One main trail leaves this road at a point near Simpson Creek and goes up Coal Creek, then connecting with a trail from Bohemia Mountain follows the divide around the east side of Steamboat Creek and connects with the North Fork of the Umpqua at its junction with Steamboat Creek. This trail, together with the Bohemia Mountain branch, was built by the forest rangers during the last year, and is of great utility to those going from the Willamette to the Umpqua River.

Another trail leaves the main road at the junction of the North Fork and the Middle Fork of the Willamette and follows up the south bank until it gets to Brock's cabin, where it crosses to the north side, ascends Grasshopper Mountain, and when it reaches the summit divides. One branch keeps on due north along the divide between the headwaters of Fall Creek and the South Fork of the McKenzie, finally descending to the McKenzie River. The latter part of the trail can only be used late in the season on account of the snow drifts, which lie very late on the ground. The other branch follows easterly along the divide and finally crosses the South Fork of

the McKenzie, crosses the divide, and leaves the reserve in T. 18 S., R. 8 E. This trail is used solely by cattlemen in driving to their ranges.

The next main trail follows up Little River in T. 27 S., R. 1 E., ascending to the divide between the North Fork of the South Fork and the North Fork of the Umpqua, which it follows steadily until it intersects the Rogue River trail, which it leaves at the head of Fish Creek, turning thence to the east, and, finally going around Mount Bailey to the south, makes a direct course to the Klamath Indian Reserve.

Numerous connecting trails radiate from the main trails connecting the different streams. These have nearly all been put in by rangers and cattle and sheep men. The rangers in the southern part of the reserve have done some very good work on the trails during the past year, opening old and building new ones, and had it not have been for these means of travel last season's work would have been seriously retarded, as the whole country is very heavily timbered and, the divide being very irregular, great difficulty would have been encountered in going from one place to another, owing to the impossibility of seeing out. Two of the roads start from the Bohemia mining district in T. 23 S., R. 1 E., the one following down Frank Brass Creek and the other down Sharpes Creek. These are used by the different mining companies in transporting their goods and ores to and from market.

NAVIGATION.

Navigation is practically out of the question, the rivers for the most part being very rapid and shallow, precluding all possibility of using them as means of travel.

RAILROADS.

There are at present no railroads in the reserve, although there is a party in the field making surveys for a road from Cottage Grove to the Bohemia mining district in T. 23 S., R. 1 E., and there is every probability that this mining district will eventually get rail connection to transport its ore to market.

TRANSPORTATION.

As regards the transportation of logs to market, the Willamette can be used for some distance for driving logs by water, and within a few miles of the western line is being used extensively, although on account of the numerous gravel bars there is no doubt but that railroading will supersede this method. The North Fork of the Willamette can also be driven for a number of miles, being a good log stream with good banks and free from obstructions usually encountered, such as jams and gravel bars.

In all logging roads electric engines should be used as a preventive of fire. The district is very dry during the summer, and the least spark would start a conflagration whose limit would be hard to tell. Numerous large fires have already

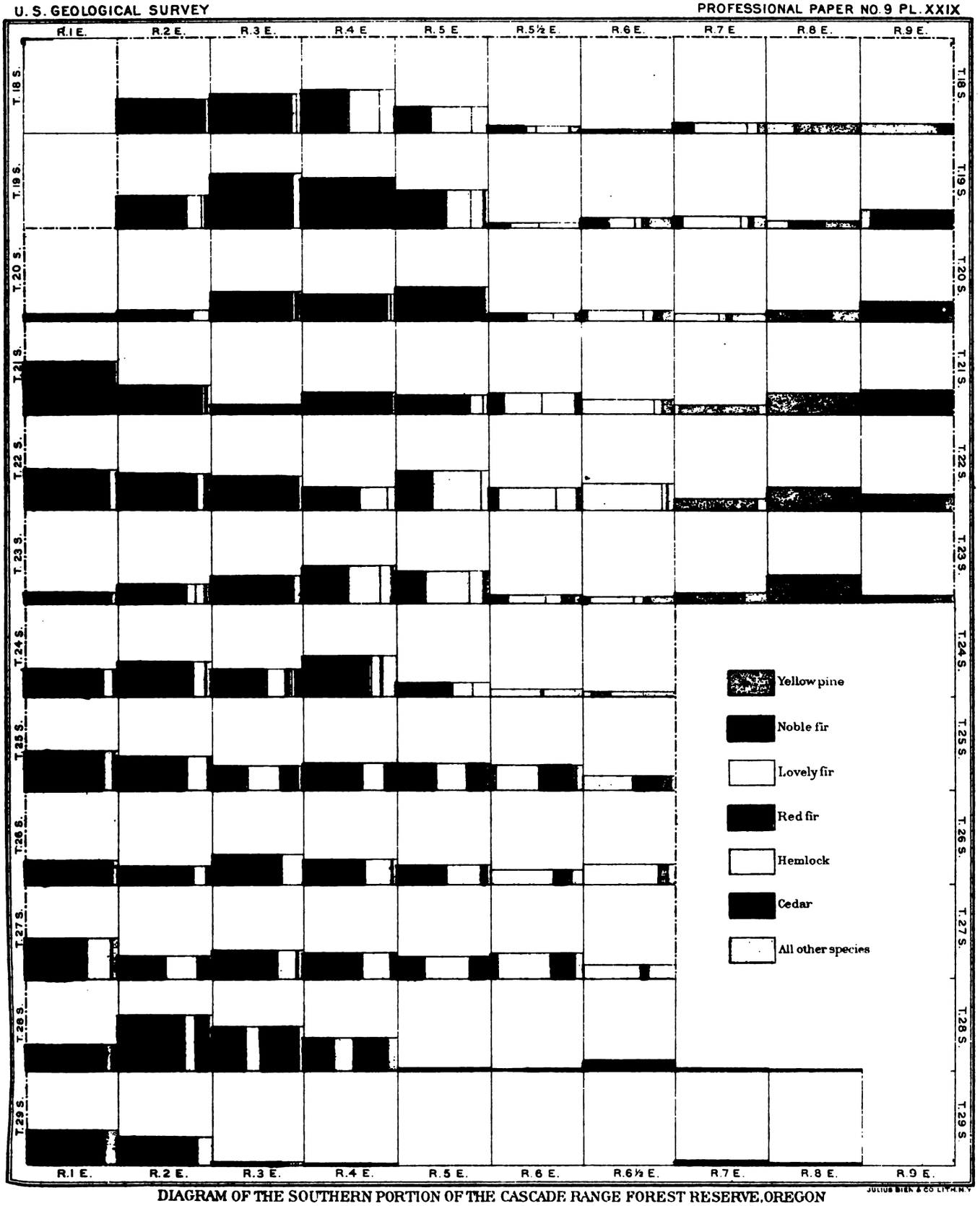


DIAGRAM OF THE SOUTHERN PORTION OF THE CASCADE RANGE FOREST RESERVE, OREGON

showing stand and commercial species of timber

Vertical scale of stand

1 0 1 2 3 billion feet B M.

JULIUS BIEN & CO. LITH. N.Y.

devastated large tracts of timber and too much care can not be used in adopting preventives.

Little difficulty would be encountered in constructing roads up the numerous streams, as the gradients for the most part are very light, the elevation generally taking place at or near their heads.

HUMUS.

On the lower areas 6 inches is a very common depth, but this depth is generally found in the lower altitudes and more particularly along the benches and bottom lands of the main rivers, the depth materially decreasing as the altitude increases, until on the highest ridges and peaks it disappears altogether.

FOREST LITTER.

The forest litter varies considerably, according to the nature of the timber and its age and degree of soundness. Along the main rivers, and in the fir belt in particular, considerable rot and decay among the old trees is met with, and as the trees fall year after year they break down and carry with them nearly everything within reach of their wide spreading branches, which cover, not uncommonly, a width of 50 or 60 feet. This opening causes the immediate growth of a dense tangle of underbrush that practically impedes all further progress, and at times a considerable detour is necessary to avoid such places.

Most of the burns in this district are very free from litter, the fires having, on account of dry climate, consumed nearly all the down timber, and all that is met with is the dropping limbs from the few remaining trees that escaped the first fury of the fire; and as the standing dead trees dry out much quicker than the down timber, the next fire that runs over the ground completely consumes them as they stand.

UNDERBRUSH.

This area is very unfavorable for the propagation of underbrush, except in the immediate western boundary and along the lower altitudes of the main streams. In the latter district it is so heavy that in places one has to cut his way through, notably around the watershed of Fall Creek and Wimble Creek, where the rhododendrons grow to an enormous size and density. Greasewood is another underbrush that is in places impenetrable. Along the Middle Fork of the Willamette up to an elevation of 2,500 feet poison oak and ivy are found very frequently, and, as many people are poisoned by touching their leaves, great care should be exercised to avoid coming in contact with them. Along the high ridges above 5,000 feet very little undergrowth is encountered, whereas the densest growth of the underbrush is found along the tops of the ridges below that altitude. Usually the tops of the main divides are practically clear of this growth, but in this area the reverse is found to be true. Along

the eastern slope of the Cascade Mountain very little undergrowth is found, as the climate is much drier, the precipitation being too little to foster the growth.

YOUNG GROWTH.

The young growth east of the mountains is generally lodgepole pine and yellow pine where that timber is found, and in nearly every case where burns occur the lodgepole predominates.

Along the western slope the timber reproduces itself readily, but in burns hemlock is common, although at present the burns are young and cleanly burned off, and the rhododendrons and greasewood grow so rapidly and densely that the young tree is generally smothered out before it gets large enough to hold its own. This is true more particularly of the North Fork of the Umpqua belt, where there is practically no reproduction at all among the numerous burns owing primarily to the above reason.

LOGGING.

Logging has not been carried on within the boundaries of this portion of the reserve, the nearest approach to it being made on Fall Creek, down which considerable logging has been carried on.

MINING.

Within the boundaries of the reserve considerable work in mining and prospecting has been carried on, notably at the Bohemia mining district, mentioned below, where there are at present three producing mines with stamp mills, although in July there was only one in active operation. The mineral is generally free-milling gold ore on the surface, but runs into base as they descend. This seriously retards all work, as to ship their ore to the smelters at present is impracticable; but a railroad is being surveyed from Cottage Grove into that district, and when it reaches there and is in operation it will open up one of the best mining districts in western Oregon. At present considerable capital has been invested, and more would be forthcoming were railroad connections to be had. Another promising gold-mining belt is located at the head of the South Fork of Fall River, just over the divide on the North Fork of the Willamette River. This district was only discovered last summer, and as it is in its infancy very little can be said as to its permanency.

In fact, nearly all of the western slope of the Cascades is mineralized with gold, silver, iron, and coal. On the main ridges local attraction is so great that in but few places can a needle be used, the attraction having been noticed to reach as high as 20° variation.

In T. 22 S., R. 1 and 2 E., and T. 23 S., R. 1 and 2 E., over 6,000 mining locations are in existence upon which mining assessment work has been done. This

CROOKED TREE IN HEMLOCK FOREST NORTH OF LAKE WALDO.

district is known as the Bohemia mining district. Considerable agitation is being carried on to have these townships restored to the public domain principally from the fact that the land is nearly all covered by mining locations. This same district, with the exception of T. 23 S., R. 1 and 2 E., is very heavily timbered with red fir, and contains some of the best timbered areas. Most of T. 23 S., R. 1 E., has been burned off, and doubtless the same result will occur to the other townships as soon as active mining operations take place, but this will not be before the railroad reaches this vicinity and permits the shipping of ore.

FOREST TREES.

Range of forest trees in Cascade Range Forest Reserve between townships 18 and 29 south.

Common name.	Botanical name.	Altitudinal range.
		Feet.
Cottonwood	Populus trichocarpa	0 to 2,000
Alder	Alnus oregona	0 to 2,250
Maple	Acer macrophyllum	0 to 2,250
Red cedar	Thuja plicata	0 to 4,750
Incense cedar	Libocedrus decurreus	0 to 5,750
Noble fir	Abies nobilis	5,000 to 6,400
Mertens hemlock	Tsuga mertensiana	0 to 5,000
Red fir	Pseudotsuga taxifolia	0 to 5,500
Yellow pine	Pinus ponderosa	1,250 to 6,400
Sugar pine	Pinus lambertiana	1,250 to 2,600
White pine	Pinus monticola	1,000 to 6,500
Yew	Taxus brevifolia	500 to 5,800
Engelmann spruce	Picea engelmanni	4,800 to 5,950
Lovely fir	Abies amabilis	2,000 to 5,250
Alaska cedar	Chamæcyparis nootkatensis	4,500 to 6,000
Lodgepole pine	Pinus murrayana	4,000 to 7,250
Subalpine fir	Abies lasiocarpa	6,000 to 7,750
Patton hemlock	Tsuga pattoniana	5,000 to 7,750
White-bark pine	Pinus albicaulis	7,250 to 7,990
Oak, white		0 to 1,500
Vine maple	Acer circinatum	0 to 4,100
Rhododendron	Rhododendron californicum	0 to 3,900
Dogwood	Cornus nuttallii	0 to 1,500
Crab apple	Pyrus rivularis	0 to 1,500
Bearberry	Rhamnus purshiana	0 to 1,500
Balm of Gilead	Populus balsamifera	0 to 2,000

On the east side of the Cascade Mountains the species of timber completely changes. This fact becomes evident to the eye as soon as the main divide is reached. The fir timber at once disappears, with the exception of a few isolated spots, and the

lodgepole and yellow pine become the predominating timber species, together with the Patton hemlock upon the higher ridges. As soon as the elevation of 5,000 feet is reached upon descending the western slope the red fir becomes the main tree species. Upon the Willamette and its tributaries this tree reaches an altitude of 5,250 feet, with occasional spots going as high as 5,500 feet, as on the South Fork and Coal Creek, while on the North Fork of the Umpqua it does not exceed on an average 5,000 feet, although particular spots have been noticed as high as 5,250 feet, but the main elevation may be relied upon as 5,000 feet.

As soon as the fir timber ceases Patton hemlock and noble fir commence, and the Patton hemlock runs up to an elevation of 7,750, while the noble fir stops at 6,400 feet. Above this elevation nothing but Patton hemlock, lodgepole pine, subalpine fir, and white-bark pine is found, the latter reaching an elevation of 7,990 feet at the highest point upon which timber is found to be growing, viz, Mount Bailey on the southern boundary.

The elevation of timber line on Diamond Peak was found to be 7,775 feet. The growth here is composed principally of scrub white-bark pine of an average height of 6 feet and a diameter of 6 inches on the stump. The heaviest growth of fir timber was found on the tributaries of the North Fork of the Willamette and the Middle Fork, where it grows very dense, the timber on the lower benches showing great signs of decay and rot; but as the elevation increases and the immediate vicinity of the rivers is left the quality rapidly improves, showing that the heavy fogs that settle over the rivers during the forenoon and then as rapidly disappear during the heat of the day, leaving the dampened timber to the full heat of the sun, are the main cause of its deterioration, and at an elevation of 1,000 feet above the river bottoms, at which elevation the fog generally hangs, the fir timber shows practical signs of its freedom from disease and stump rot, which affects at least 15 or 20 per cent of the lowland fir belt.

The whole of the lower zone of the Umpquas is red fir, with scattering hemlock and noble fir upon the higher ridges. The latter timber is of fair quality and does not show many signs of decay. The yellow-pine zone crosses the Cascade Range along the military road and follows down the Middle Fork of the Willamette and reaches outside of the reserve to the west. It again crosses the reserve line near the Big Marsh, reaches over to the North Fork of the Umpqua, follows that river down to the junction of the stream from Diamond Lake, then follows said stream southerly to Diamond Lake and continues south, and then follows down the Rogue River.

The largest body of yellow-pine timber is found at pine openings of the Middle Fork of the Willamette, where it and sugar pine are main timber species. A notable feature is the rough-bark cedar, a species similar to the red cedar, but with a distinctive bark, the main difference being in its thickness, for while the red cedar

A.

B.

TRAIL TO BOHEMIA MINING CAMP FROM MIDDLE FORK OF WILLAMETTE RIVER.

has a covering of only about 2 inches, the other has a bark in some instances 1 foot thick, which is a great protection against fire. The timber is of fine quality, the tree being very tall and evidently of great commercial value. A notable exception in the distribution of timber is observed with regard to the lodgepole pine. On the northern portion of the reserve this species does not cross to the western side of the Cascade Range, but south of Cowhorn Mountain, which is immediately south of Lake Crescent, it crosses the divide and reaches over to the North Fork of the Umpqua, following it down and around to Diamond Lake in the same zone as the yellow pine; yet it does not follow the yellow-pine zone down the Willamette River, only reaching a little west of Summit Lake.

RECOMMENDATIONS.

Considerable quantities of red fir located within the confines of the reserve, notably upon the Middle Fork of the Willamette, in the immediate vicinity of the river and upon the neighboring benches, are seriously affected with rot, such as stump rot and konks. These trees are gradually dying and falling, and in their descent ruining good timber. This timber has seen its best day, and every year decreases its scale in quantity and quality. For the protection of the adjacent timber belts from fires caused by the falling timber, and to receive some value in return for this area, it would be advisable to remove it as soon as possible, otherwise in a few years it will be totally valueless; if logged off at the earliest opportunity some returns might be had, while delay only adds to the danger of the good timber, and eventually it will become unsalable.

SHEEP GRAZING.

Large numbers of sheep, amounting to several thousand, are annually driven from Prineville and neighborhood up into the eastern portion of the reserve, some bands crossing the divide and grazing down the North Fork of the Umpqua and along the different divides west of the Cascade Range, leaving the reserve about the end of September, although one bunch was seen as late as October. This latter band came from Roseburg, and was pastured along the divide by Quartz Mountain and Black Rock. These sheep ate up everything in sight, destroyed all the young growth, and where there would have been grass were they driven out of the reserve in September they left not even a green blade in these tracts, and doubtless killed by tramping down in the snow any grass that might have escaped them. On account of this band we had to drive our horses for two days before we could get feed for them, all the pasture having been trodden down and killed by these sheep. The rangers should have patches of feed reserved at different stations, say at each day's march, so that all horses could rely on finding feed and not have to go perhaps days without any.

For the better protection of the grazing lands sheep should not be permitted to remain within the reserve after September 15, as their presence after that date seriously injures the grass and young growth.

LOCAL DEMAND FOR TIMBER.

The only demand within the confines of the reserve is in the Bohemia mining district, where the mines consume large quantities of fir in operating their stamp mills, and in the near future, with railroad connection, this will largely increase. Last year there was probably 10 acres cut for firewood for one company only, the other being idle.

AGE AND SIZE OF TREES CUT AT DIFFERENT ELEVATIONS.

Species.	Height.	Diameter.	Age.	Elevation cut.
	Feet.	*Inches.*	*Years.*	*Feet.*
Mertens hemlock	79	10½	79	1,290
Patton hemlock	120	28½	348	5,600
Lodgepole pine	103	32	215	6,500
White pine	190	33	188	2,500
Yellow pine	225	43½	215	2,225
Noble fir	125	53½	163	6,000
Engelmann spruce	100	13½	165	5,000
Red fir	125	23½	115	1,350
Red cedar	60	13½	107	1,300
Lodgepole pine	98	11½	120	5,000
Sugar pine	97	17½	96	1,600
White fir	57	11	220	1,300
Lovely fir (exception)	24	14	75	6,925
Soft maple	55	9½	55	1,320
Lovely fir	60	13¼	106	5,350
Alder	40	12	60	1,320
Incense cedar	100	27¾	160	1,350
Lovely fir	108	30½	174	6,000
Patton hemlock	115	29¾	124	6,000
Engelmann spruce	110	28¼	290	5,600
Patton hemlock	45	22	116	6,925
White fir	140	16	106	2,500
Lodgepole pine	24	14	82	6,925
Lovely fir	92	23½	78	4,725
Silver poplar	46	14	120	5,310

A. TRAIL TO BOHEMIA MINING CAMP FROM MIDDLE FORK OF WILLAMETTE RIVER.

B. BENCH ON NORTH FORK OF MIDDLE FORK OF WILLAMETTE RIVER.

TOTAL ESTIMATE OF TIMBER.

	Feet B. M.		Feet B. M.
Red fir	17,802,500,000	Yellow pine	2,624,750,000
Red cedar	527,000,000	White pine	548,250,000
Incense cedar	22,250,000	Sugar pine	9,250,000
Hemlock	7,054,000,000	Lodgepole pine	580,500,000
Noble fir	1,500,000,000	Engelmann spruce	17,000,000
Lovely fir	1,186,750,000		
White fir	3,000,000	Total	31,875,250,000

DESCRIPTIONS OF TOWNSHIPS.

Township 18 South, Range 2 East.

This township lies on the west slope of the range, near its base, and is drained by Fall Creek and its branches. The surface consists of steep, broken hills.

The soil is of red shot clay.

The undergrowth is dense, consisting of vine maple, arrowwood, yew, dogwood, huckleberry, willow, alder, chinquapin, laurel, soft maple, and ferns, with young conifers.

The timber consists chiefly of red fir in very heavy stands, especially in the northern part of the township, where the quality is excellent. In the southern part the stand is not so heavy nor is the quality so good.

The timber can be logged to Fall Creek and its branches, which is a very good logging stream during the winter season.

During the season of 1900 there were logged into this stream 3,000,000 feet of fir timber, which were driven through the Williamette by means of splash dams built for the purpose.

Classification of lands and forest conditions in T. 18 S., R. 2 E.

Forested area	acres	18,770
Burned area	do	4,270
Total stand	feet B. M.	520,750,000
Average stand per acre	do	28,200
Litter		Heavy.

Statistics of forest trees in T. 18 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	461,000	186	40	49	13	46	208
Cedar	32,250	99	23	19	9	18	171
Hemlock	27,500	8	15	13	6	7	108

Township 18 South, Range 3 East.

This township lies upon the west slope of the range and consists of the valley of Fall Creek and its branches, with high mountain spurs separating them. The surface is steep or rolling.

The soil is red shot clay, quite stony on the ridges.

The undergrowth is dense, consisting of vine maple, huckleberry, rhododendron, salal, yew, arrowwood, dogwood, chinquapin, soft maple, and laurel, with some young conifers.

The township is heavily timbered, mainly with red fir, 40 per cent of which is of excellent quality and 23 per cent is diseased. A small amount of cedar of good quality is found, mainly upon the creeks. Other species are small and of little value.

The township can be logged to Fall Creek, but in its present condition this stream is of no value for driving purposes, as it has low banks, and, excepting in time of flood, an insufficient amount of water. The valley, however, is open, and would afford an easy route for a railroad into this township.

Classification of lands and forest conditions in T. 18 S., R. 3 E.

Forested area	acres	22,940
Burned area	do	100
Total stand	feet B. M.	679,000,000
Average stand per acre	do	29,600
Litter		Light.

Statistics of forest trees in T. 18 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	616,000	172	30	54	7	23	225
Cedar	7,000	100	20	16	.....	10	160
Hemlock	35,000	80	13	14	.....	5	137
Lovely fir	21,000	100	20	16	.....	5	160

Township 18 South, Range 4 East.

This township lies upon the west slope of the range, and is drained in the main by Fall Creek, a tributary to the Willamette River. The surface is rugged and mountainous.

The soil is red shot clay, very stony on the ridges.

The undergrowth is dense along the creeks and light on the uplands, and consists of huckleberry, salal, vine maple, rhododendron, alder, yew, arrowwood, chinquapin, and laurel, with young conifers.

The timber, which is heavy, consists of red fir, hemlock, and lovely fir. The heaviest stands of fir are found in the valley of Fall Creek, that upon the ridges being rather rough and scrubby.

The township can be logged to Fall Creek, with the exception of the northern portion, the timber on which will have to go to the South Fork of the McKenzie River.

Classification of lands and forest conditions in T. 18 S., R. 4 E.

Forested area	acres..	23,000
Total stand	feet B. M..	681,000,000
Average stand per acre	do....	29,500
Litter		Light.

Statistics of forest trees in T. 18 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	351,000	128	26	33	2	33	213
Hemlock	239,000	88	18	18	.....	9	164
Lovely fir	91,000	92	18	17	.....	5	174

Township 18 South, Range 5 East.

This township lies upon the west slope of the range, and includes a section of the valley of the South Fork of McKenzie River, with a broad, heavy spur upon the west. The surface is in the main steep and rugged.

The soil consists of red shot clay, very stony on the ridges.

The timber consists mainly of red fir and hemlock, with some lovely fir and a little white pine. None of these species are of good quality as timber. The forest is found mainly in the valley, the ridges being covered with a thin, sparse growth, with some grass land.

With the exception of a small tract in the southwest corner of the township, it can be logged to the North Fork of the Willamette. The timber on the southwest part can all be hauled to the South Fork of McKenzie River.

Classification of lands and forest conditions in T. 18 S., R. 5 E.

Forested area	acres..	22,105
Grass area	do....	935
Total stand	feet B. M..	451,500,000
Average stand per acre	do....	20,400
Litter		Light.

Statistics of forest trees in T. 18 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	180,000	136	23	20	5	40	177
Hemlock	199,000	88	18	13	2	6	168
Lovely fir	64,500	86	17	17	2	9	164
White pine	8,000	100	20	21	.....	5	180

Township 18 South, Range 5½ East.

This fractional township consists of five tiers of sections, thirty in all. It lies a little east of the Cascade Range, and consists almost entirely of high, broad mountain spurs. Across its southwest corner flows the South Fork of McKenzie River, in a deep, narrow valley. The surface is in the main rugged and mountainous.

The soil consists of a clay pumice, which becomes very stony upon the ridges.

The undergrowth is very light, consisting of small lodgepole pine, yew, alder, hemlock, and laurel.

The only timber upon this township which is of any value is on or near the waters of the South Fork of McKenzie River, in its immediate valley. It consists chiefly of young red fir, with a few specimens of white pine. The upland timber consists of hemlock and small lodgepole pine, of value only for firewood.

This township can be logged to the South Fork of McKenzie River, which, however, is of no value as a logging stream. Owing to the rugged character of the country the timber will be expensive to handle.

Classification of lands and forest conditions in T. 18 S., R. 5½ E.

Forested area	acres	18,530
Burned area	do	670
Total stand	feet B. M.	81,750,000
Average stand per acre	do	4,700
Litter		Light.

Statistics of forest trees in T. 18 S., R. 5½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	33,500	114	25	19	4	9	150
Hemlock	8,500	50	13	8	6	13	152
Lovely fir	29,250	68	19	10	3	8	178
White pine	5,750	118	23	19	2	5	175
Lodgepole pine	4,750	.....	.....	.....	.....	.....	.....

Township 18 South, Range 6 East.

This township lies just east of the summit of the Cascade Range, and comprises a mountainous region, with broad, massive spurs, separated by deep gorges. The surface is rugged and broken throughout.

The soil consists of clay and gravel, everywhere very stony.

The undergrowth is dense in the northern part of the township, but light in the south. It consists of vine maple, rhododendron, willow, cherry, chinquapin, ferns, and young conifers.

The timber consists mainly of red fir of second growth, small and of poor quality. The entire township was formerly covered with a heavy growth of fir, but many years ago this was destroyed by fire, and the new growth is inferior. Aside from fir, the prevailing timber is lodgepole pine of an average height of 40 feet, by 8 inches in diameter, and of no value except for firewood.

The timber in this township can all be logged down branches of the McKenzie River, though at present this stream is of little value for logging purposes.

Classification of lands and forest conditions in T. 18 S., R. 6 E.

Forested area	acres..	22,800
Bottom area	do....	240
Total stand	feet B. M..	48,250,000
Average stand per acre	do....	2,100
Litter		Light.

Statistics of forest trees in T. 18 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	27,750	102	24	21	3	6	136
White pine	1,750	93	16	14	1	2	136
Lodgepole pine	18,750	.....	.....	.....	.....	.....	.....

Township 18 South, Range 7 East.

This township includes the summit of the range and the heads of streams flowing to the westward into McKenzie River. The surface is rolling or mountainous and broken.

The soil is red shot clay, very stony on the higher ridges.

The undergrowth is dense, consisting of vine maple, alder, willow, laurel, buck brush, manzanita, chinquapin, rhododendron, and ferns, with young conifers.

Three-fourths of this township has been the scene of a nearly clean burn, there remaining only a few scattering trees. This part of the township now contains a few old trees that survived the fire, and a sapling growth. The unburned portion,

constituting the eastern fourth of the township, contains only a light growth of rather scrubby timber of little value.

The timber standing in this township can be taken down Horse Creek, a branch of the McKenzie River, with the exception of a small portion east of the crest of the range. This, however, contains little timber of value.

Classification of lands and forest conditions in T. 18 S., R. 7 E.

Forested area	acres..	23,000
Water surface	do....	40
Total stand	feet B. M..	143,250,000
Average stand per acre	do....	6,200
Depth of humus	inches..	6
Litter		Light.

Statistics of forest trees in T. 18 S., R. 7 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	28,750	110	18	14	4	7	159
Cedar	750	80	16	11	14	8	160
Hemlock	89,000	75	15	11	2	4	167
Spruce	250	80	14	10	1	2	140
Lovely fir	14,000	72	13	10	2	4	153
Lodgepole pine	10,500						

Township 18 South, Range 8 East.

This township lies east of the range on the plateau, which here is broken by volcanic cones and floods of lava. The surface is largely composed of lava rock, with here and there a thin soil formed of pumice.

The undergrowth is light, consisting of willow, buck brush, and small lodgepole pines.

The timber consists mainly of small scrubby lodgepole pine and hemlock, neither of these species being of any value for lumber and of but little value for any purpose.

Classification of lands and forest conditions in T. 18 S., R. 8 E.

Forested area	acres..	21,750
Burned area	do....	550
Water surface	do....	740
Total stand	feet B. M..	63,750,000
Average stand per acre	do....	2,900
Litter		Light.

Statistics of forest trees in T. 18 S., R. 8 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	18,500	70	16	10	10	19	203
Lodgepole pine	45,250						

Township 18 South, Range 9 East.

This township lies upon the plateau east of the range. It is greatly broken with volcanic mountains and buttes, including Batchelor Butte, 9,225 feet, and Tumelo Mountain, 8,060 feet. The surface is covered to a great extent with lava rock and scattered pumice stone.

The undergrowth is light, consisting of huckleberry bushes, with small lodgepole pines, hemlocks, and firs.

The timber consists chiefly of hemlock, with a little yellow and lodgepole pine. None of this timber is of any special value for lumber purposes.

This township will be very expensive to log, owing to the broken character of the surface. The timber can be taken out by way of the Deschutes River and its West Fork, although it is not likely to be needed for a long time to come.

Classification of lands and forest conditions in T. 18 S., R. 9 E.

Forested area	acres..	23,040
Total stand	feet B. M..	162,500,000
Average stand per acre	do....	7,000

Statistics of forest trees in T. 18 S., R. 9 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	143,000	75	20	10	3	12	188
Yellow pine	10,500	108	26	17	3	13	
Lodgepole pine	9,000						

Township 19 South, Range 2 East.

The surface of this township is steep and rugged, rising in the eastern part and in Sour Grass Mountain to an altitude of 3,200 feet. It is drained mainly by Wimble Creek.

The soil consists of red shot clay, very stony on the ridges.

The undergrowth consists of dense huckleberry, salal, vine maple, arrowwood,

yew, manzanita, dogwood, willow, alder, and ferns, with some young coniferous trees.

The timber consists chiefly of red fir, which grows in very heavy stands on some sections. Perhaps 30 per cent is of good quality, the remainder being rather rough and knotty. Along the western edge of the township the timber has been somewhat injured by light fires. The hemlock and lovely fir grow mostly on the high ridges.

This township can be logged westward down Wimble Creek, with the exception of the small tract along the north line of the township, which is tributary to Fall Creek on the north.

Classification of lands and forest conditions in T. 19 S., R. 2 E.

Forested area	acres	22,260
Burned area	do	660
Grass area	do	120
Total stand	feet B. M.	518,000,000
Average stand per acre	do	23,200
Litter		Light.

Statistics of forest trees in T. 19 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	372,000	152	26	26	4	33	177
Cedar	4,000	80	12	16	2	10	140
Hemlock	80,000	85	17	16	9	5	160
Noble fir	29,500	100	19	20	.....	5	177
Lovely fir	32,500	87	18	17	5	5	162

Township 19 South, Range 3 East.

This township consists mainly of mountain spurs, sloping southward and eastward to the North Fork of Willamette River. With an altitude exceeding 5,000 feet down to less than 2,000 feet in the river valley, the surface ranges from rugged and broken to rolling. The soil is of red shot clay and very stony.

The undergrowth is everywhere light, consisting of huckleberry, rhododendron, vine maple, laurel, chinquapin, alder, yew, arrowwood, and salal, with some young conifers. The timber, consisting almost entirely of red fir, is very heavy, and at least 50 per cent of it is of good quality. Other species are small and of little value.

Nearly all of this township can be logged to the North Fork of the Willamette River, which is a good logging stream during the winter season. The small portion on the north will log to Fall River.

Classification of lands and forest conditions in T. 19 S., R 3 E.

Forested area	acres..	23,040
Total stand	feet B. M..	860,000,000
Average stand per acre	do....	37,300
Litter		Light.

Statistics of forest trees in T. 19 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	807,000	198	30	50	.....	25	223
Cedar	4,000	80	16	12	.....	10	170
Hemlock	32,000	73	10	9	.....	5	122
Lovely fir	17,000	83	14	11	.....	5	152

Township 19 South, Range 4 East.

This township, on the western slope of the range, consists of heavy spurs, separated by narrow stream valleys. The country is rugged and broken.

The soil consists of red shot clay.

The undergrowth is light, consisting of vine maple, yew, huckleberry, rhododendron, laurel, salal, chinquapin, and arrowwood, with a few young conifers.

The timber consists chiefly of red fir, and is very heavy, with 50 per cent of good quality. The cedar and hemlock are small and of not much value.

This township can all be logged to the North Fork of the Middle Fork of Willamette River, which is a very good logging stream during the winter season.

Classification of lands and forest conditions in T. 19 S., R. 4 E.

Forested area	acres..	23,040
Total stand	feet B. M..	802,500,000
Average stand	do....	34,800
Litter		Light.

Statistics of forest trees in T. 19 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	780,000	200	30	60	.....	25	225
Cedar	15,000	80	13	17	.....	10	146
Hemlock	7,500	70	12	15	.....	5	140

Township 19 South, Range 5 East.

This township, lying on the western slope, is composed entirely of high, rugged mountain spurs and summits. It is drained by McKenzie and Willamette rivers.

The soil consists of red shot clay, very stony.

The undergrowth is light, composed of salal, laurel, willow, yew, rhododendron, manzanita, vine maple, and alder, with some young conifers.

The timber, which is fairly heavy, consists mainly of red fir, most of which is found on the watershed of Willamette River, and half of it is of good quality. The other species are rough and poor.

The western part of this township can be logged into the North Fork of Willamette River, while the timber on the eastern part can go down a branch of the South Fork of McKenzie River.

Classification of lands and forest conditions in T. 19 S., R. 5 E.

Forested area	acres	22,320
Burned area	do	310
Grass area	do	410
Total stand	feet B. M.	576,000,000
Average stand per acre	do	25,800
Litter		Light.

Statistics of forest trees in T. 19 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	318,000	155	26	41	5	27	204
Hemlock	144,000	100	15	16	.....	5	158
Lovely fir	94,000	92	16	18	.....	5	160
White pine	20,000	125	20	20	.....	5	180

Township 19 South, Range 5½ East.

This fractional township, consisting of thirty sections, lies west of the summit of the range, and is composed of high mountain spurs separated by valleys of the South Fork of the McKenzie River and its branches, together with a small area in the south drained to Willamette River. The surface is very rugged and mountainous.

The soil consists of red shot clay, which becomes very stony on the ridges.

The undergrowth is light, consisting of vine maple, alder, yew, laurel, and willow, with young firs, pines, and hemlocks.

The timber on this township consists mostly of lovely fir and hemlock, with a little red fir in the valleys. The first two species are of little or no value for

A. BENCH ON NORTH FORK OF MIDDLE FORK OF WILLAMETTE RIVER.

B. YELLOW PINE NEAR HAZELDALE POST-OFFICE.

lumber, since they are small, rough, and scrubby, while of the red fir about one-fifth is estimated to be of good quality.

The northern part of this township can be logged to the South Fork of McKenzie River, which, however, in its present condition is of no value as a logging stream. The little timber standing in the southern part of the township can be logged to the North Fork of the Willamette.

Classification of lands and forest conditions in T. 19 S., R. 5½ E.

Forested area	acres	15,980
Burned area	do	2,060
Grass area	do	1,160
Total stand	feet B. M.	56,000,000
Average stand per acre	do	3,500
Litter		Light.

Statistics of forest trees in T. 19 S., R. 5½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	12,250	97	22	19	7	24	156
Hemlock	16,250	57	15	8	5	14	166
Noble fir	1,000	75	20	16	2	5	180
Lovely fir	24,750	60	17	9	4	8	170
White pine	500	100	20	16	2	5	170
Lodgepole pine	1,250						

TOWNSHIP 19 SOUTH, RANGE 6 EAST.

This township lies just west of the divide of the range, and includes broad, heavy spurs, separating the narrow valleys of the headwater branches of McKenzie River. The surface is rugged and mountainous.

The soil is clay, containing much pumice stone, especially in the northern part of the township.

The undergrowth is light, consisting of manzanita, laurel, vine maple, alder, and young conifers.

The timber consists mainly of hemlock and lodgepole pine, which are of no value for lumber. In the narrow valleys of the streams are found small bodies of red fir, both of old growth and of young trees, which furnish lumber of excellent quality.

The timber on this township can all be logged west down the South Fork of Willamette River, but it will be very expensive to handle the timber, since the country is rugged. The stream is of no value for driving purposes in its present condition.

Classification of lands and forest conditions in T. 19 S., R. 6 E.

Forested area	acres..	20,980
Burned area	do....	2,060
Total stand	feet B. M..	83,750,000
Average stand per acre	do....	4,000
Litter		Light.

Statistics of forest trees in T. 19 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	20,750	116	24	20	7	16	186
Hemlock	26,750	61	14	11	3	6	180
Lovely fir	6,000	50	12	10	2	4	146
White pine	2,000	130	24	24	1	4	170
Lodgepole pine	28,250						

Township 19 South, Range 7 East.

This township is traversed by the summit of the Cascade Range. It has a rolling surface, interrupted by a few volcanic buttes. The elevation ranges from 5,000 to 7,000 feet.

The soil is mainly of clay, with much pumice stone scattered through it.

The undergrowth is light, consisting of vine maple, alder, manzanita, huckleberry, laurel, and chinquapin, with a small coniferous growth.

The timber consists of several species, mainly those peculiar to high altitudes. More than half of it consists of hemlock, with considerable lodgepole pine. These two species are both rather small and of poor quality, having little or no value for lumber. On the west side of the township there is a scanty growth of young fir, following a fire.

This timber can be logged by way of a branch of McKenzie River, while such timber as there is in the eastern side of the township can be taken down the West Fork of Deschutes River.

Classification of lands and forest conditions in T. 19 S., R. 7 E.

Forested area	acres..	22,960
Water surface	do....	80
Total stand	feet B. M..	141,750,000
Average stand per acre	do....	6,100
Litter		Light.

Statistics of forest trees in T. 19 S., R. 7 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years*
Fir	9,500	110	19	15	4	8	163
Hemlock	102,250	68	16	12	7	8	175
Lovely fir	10,500	62	12	10	2	5	161
White pine	4,500	128	24	21	1	4	168
Lodgepole pine	15,000						

Township 19 South, Range 8 East.

This township lies east of the Cascade Range, upon a plateau, and includes the valley of a branch of Deschutes River, with lava ridges upon either side. The surface is in the main broken, rugged, and covered with lava rock.

The undergrowth is light. The timber consists of lodgepole and yellow pine and hemlock. The lodgepole pine and hemlock are of no value for lumber, but in the southern part of the township are scattered bodies of yellow pine of excellent quality. This timber can be handled southward to the West Fork of Deschutes River, which is a very good logging stream during the spring floods.

Classification of lands and forest conditions in T. 19 S., R. 8 E.

Forested area	acres	18,165
Burned area	do	4,165
Water surface	do	710
Total stand	feet B. M	84,000,000
Average stand per acre	do	4,600
Litter		Light.

Statistics of forest trees in T. 19 S., R. 8 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	20,250	65	15	10	3	7	181
White pine	31,500	108	25	18	4	7	215
Lodgepole pine	32,250						

Township 19 South, Range 9 East.

This township lies on the plateau east of the range, and consists in the main of gently rolling country, rising in the west, however, to volcanic buttes.

The soil is clay, with much pumice stone interspersed with lava beds.

The undergrowth is very light, consisting of salal and manzanita, with small pines.

The timber consists almost entirely of yellow pine, which, on the east of the township, is of good quality, but in the more broken country is small and scrubby. In this region it is interspersed with some hemlock and lodgepole pine.

This township can be logged to Deschutes River, which is a good logging stream.

Classification of lands and forest conditions in T. 19 S., R. 9 E.

Forested area	acres..	23,040
Total stand	feet B. M..	263,750,000
Average stand per acre	do....	11,400
Litter		Light.

Statistics of forest trees in T. 19 S., R. 9 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	28,750	74	16	9	3	6	164
Yellow pine	233,000	120	30	20	3	5	220
Lodgepole pine	2,000						

Township 20 South, Range 1 East.

This township lies well down upon the slope of the range to the westward. It includes a section of the Willamette River Valley, with hill spurs on the west. The surface is hilly and broken.

The soil is red shot clay, stony on the ridges.

The undergrowth is dense, consisting of young conifers, with vine maple, huckleberry, thimble berry, willow, salal, alder, laurel, soft maple, dogwood, arrowwood, and yew. A large portion of this township, including more than half the area, was burned over many years ago, destroying all the timber upon it, which had a very heavy stand prior to the fire. The timber upon a large portion of this township is not heavy, and consists almost entirely of red fir of fair quality, except a small area in the southwestern corner, which is fair.

This township can be logged to the Willamette River, which is a good logging stream, with the exception of the southwest corner, from which the timber will have to be taken down Lost Creek.

Classification of lands and forest conditions in T. 20 S., R. 1 E.

Forested area	acres..	10,120
Burned area	do....	12,920
Total stand	feet B. M..	115,250,000
Average stand per acre	do....	11,000
Litter		Heavy.

Statistics of forest trees in T. 20 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	113,500	154	30	26	18	44	193
Hemlock	1,750	80	16	14	4	4	150

TOWNSHIP 20 SOUTH, RANGE 2 EAST.

This township lies on the west slope of the Cascade Range, and includes a section of the valley of Willamette River, with the ridges upon either side. With the exception of the narrow valley of the river, the surface of the township is steep and rugged.

The soil is red shot clay, very stony on the hills.

The undergrowth is dense, consisting of vine maple, alder, soft maple, arrow-wood, hazel, yew, chinquapin, laurel, huckleberry, salal, manzanita, scrub oak, and ferns, with young conifers.

The stand of timber is not heavy, and consists chiefly of red fir of good quality, and in fairly heavy stands on the southwest side of the river, while on the northeast side it is much more scanty and scrubby.

This township can all be logged to the Willamette River, which is a good logging stream at nearly all seasons of the year, with the exception of a small tract on the north side of the township, which must be logged to Wimble Creek, a small branch of Willamette River.

Classification of lands and forest conditions in T. 20 S., R. 2 E.

Forested area	acres..	22,630
Burned area	do....	410
Total stand	feet B. M....	189,500,000
Average stand per acre	do....	8,300
Litter		Light.

Statistics of forest trees in T. 20 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	117,500	137	27	23	8	43	175
Cedar	19,750	100	22	15	8	18	157
Hemlock	28,750	75	14	11	5	11	150
Lovely fir	11,000	77	15	12	3	7	164
White pine	2,500	142	24	32	2	5	200

Township 20 South, Range 3 East.

This township lies well down upon the western slope of the range and consists of broad slopes leading down to the valley of the North Fork of Willamette River. The surface is in the main steep and rugged, and it is drained by the North Fork of Willamette River, which flows southwestward across it.

The soil consists of red shot clay, with more or less gravel.

The undergrowth is dense, consisting of elder, vine maple, alder, salal, rhododendron, cedar, hemlock, huckleberry, soft mapel, laurel, yew, arrowwood, dogwood, chinquapin, and ferns, with considerable young coniferous growth.

The timber consists almost entirely of red fir in heavy stands, with a little cedar and hemlock. The fir is of excellent quality, and the other species are small and of little value.

This township can be logged cheaply and easily into the North Fork of the Willamette, which is a very good logging stream during the winter season.

Classification of lands and forest conditions in T. 20 S., R. 3 E.

Forested area	acres	22,765
Grass area	do	275
Total stand	feet B. M.	472,500,000
Average stand per acre	do	20,700
Litter		Light.

Statistics of forest trees in T. 20 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	415,000	156	28	36	4	29	206
Cedar	22,000	95	19	16	4	10	151
Hemlock	23,500	81	14	17	6	3	139
Lovely fir	8,000	90	16	20	1	5	150
White pine	4,000	100	20	24	1	5	175

Township 20 South, Range 4 East.

This township lies upon the west side of the range and includes part of a heavy spur separating the North Fork of Willamette River from Salmon Creek. The surface is mainly rugged and mountainous.

The soil is of red shot clay, very stony.

The undergrowth is dense along creek bottoms and light on the ridges, consisting of huckleberry, vine maple, willow, alder, laurel, manzanita, yew, arrowwood, ferns, and salal, with young conifers.

The timber consists mainly of heavy stands of red fir, particularly heavy in the valleys of the North Fork of Willamette River and Salmon Creek. At least 40 per

cent of it is estimated to be of good quality. Along the summit of the divide, where he timber is scanty, it consists mainly of hemlock and lovely fir, all of which is scrubby and of little value.

The northern part of this township can be logged to the North Fork of Willamette River, which is a very good logging stream in the winter season. On the south side the timber can be logged to Salmon Creek, which in its present condition is not a good logging stream. There is, however, a good route for a railroad up this valley.

Classification of lands and forest conditions in T. 20 S., R. 4 E.

Forested area	acres..	21,110
Burned area	do....	1,820
Water surface	do....	110
Total stand	feet B. M..	406,500,000
Average stand per acre	do....	18,700
Litter		Light.

Statistics of forest trees in T. 20 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	326,000	152	32	38	12	32	202
Cedar	19,250	79	18	18	5	11	123
Hemlock	30,500	61	12	12	4	12	150
Lovely fir	23,000	83	14	14	4	18	184
White pine	7,750	105	24	24	3	5	166

Township 20 South, Range 5 East.

This township lies upon the west slope of the range and is comprised mainly in a broad, heavy spur, separating the North Fork of Willamette River from Salmon Creek, with a portion of the valleys of these two streams. It is mainly rugged and mountainous.

The soil consists of red shot clay, very stony on the ridges.

The undergrowth is dense along the creeks, but is light on the ridges. It consists of vine maple, alder, yew, arrowwood, huckleberry, laurel, manzanita, dogwood, chinquapin, and salal, with considerable young conifers.

The stand of timber is heavy, consisting in the main of red fir, 30 per cent of which is of good quality. It is particularly heavy in the valleys of the North Fork of the Willamette and Salmon Creek. On the ridges the timber is mainly hemlock, lovely fir, and white pine, all of poor quality. There is a little cedar, which, although small, is of good quality.

On the north side of the divide this township can be logged to the North Fork of the Willamette River, which is a very good logging stream during the winter

season. On the south of the divide the timber can be logged to Salmon Creek, which, however, in its present condition can not be used as a driving stream

Classification of lands and forest conditions in T. 20 S., R. 5 E.

Forested area	acres	21,410
Burned area	do	470
Grass area	do	1,160
Total stand	feet B. M.	506,250,000
Average stand per acre	do	23,600
Litter		Light.

Statistics of forest trees in T. 20 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	412,000	144	27	27	4	31	170
Cedar	28,000	84	19	14	5	10	154
Hemlock	28,000	75	14	12	3	10	160
Lovely fir	26,750	82	17	12	2	7	164
White pine	11,500	109	21	22	2	6	181

Township 20 South, Range 5½ East.

This township lies west of the divide of the Cascade Range and is drained by the North Fork of Willamette River. The surface consists of high, broken mountain spurs, very steep and rugged.

The soil is very stony, red shot clay.

The undergrowth is dense, consisting of vine maple, rhododendron, yew, arrowwood, alder, willow, huckleberry, dogwood, salal, and ferns, together with many small firs and hemlocks.

The timber stand, which is light, consists of hemlock, lovely fir, and white pine on the divides and red fir in the valleys. About 40 per cent of the timber is of good quality. Many years ago a large part of this township was burned over and the timber destroyed. Previous to this fire the tract was heavily timbered with an old growth of red and yellow fir.

The timber in the northern part of this township can be logged to the North Fork of Willamette River, while in the southern part it will go to Salmon Creek, a tributary of the same river.

Classification of lands and forest conditions in T. 20 S., R. 5½ E.

Forested area	acres	15,460
Burned area	do	7,540
Water surface	do	40
Total stand	feet B. M.	116,750,000
Average stand per acre	do	7,500
Litter		Light.

cent of it is estimated to be of good quality. Along the summit of the divide, where he timber is scanty, it consists mainly of hemlock and lovely fir, all of which is scrubby and of little value.

The northern part of this township can be logged to the North Fork of Willamette River, which is a very good logging stream in the winter season. On the south side the timber can be logged to Salmon Creek, which in its present condition is not a good logging stream. There is, however, a good route for a railroad up this valley.

Classification of lands and forest conditions in T. 20 S., R. 4 E.

Forested area	acres	21,110
Burned area	do	1,820
Water surface	do	110
Total stand	feet B. M.	406,500,000
Average stand per acre	do	18,700
Litter		Light.

Statistics of forest trees in T. 20 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	326,000	152	32	38	12	32	202
Cedar	19,250	79	18	18	5	11	123
Hemlock	30,500	61	12	12	4	12	150
Lovely fir	23,000	83	14	14	4	18	184
White pine	7,750	105	24	24	3	5	166

Township 20 South, Range 5 East.

This township lies upon the west slope of the range and is comprised mainly in a broad, heavy spur, separating the North Fork of Willamette River from Salmon Creek, with a portion of the valleys of these two streams. It is mainly rugged and mountainous.

The soil consists of red shot clay, very stony on the ridges.

The undergrowth is dense along the creeks, but is light on the ridges. It consists of vine maple, alder, yew, arrowwood, huckleberry, laurel, manzanita, dogwood, chinquapin, and salal, with considerable young conifers.

The stand of timber is heavy, consisting in the main of red fir, 30 per cent of which is of good quality. It is particularly heavy in the valleys of the North Fork of the Willamette and Salmon Creek. On the ridges the timber is mainly hemlock, lovely fir, and white pine, all of poor quality. There is a little cedar, which, although small, is of good quality.

On the north side of the divide this township can be logged to the North Fork of the Willamette River, which is a very good logging stream during the winter

Statistics of forest trees in T. 20 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M. feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	8,500	146	26	26	18	12	180
Hemlock	97,000	80	17	13	3	4	186
Noble fir	500	100	20	20	2	4	150
Lovely fir	18,250	64	11	11	1	3	156
White pine	10,500	119	26	22	2	4	151
Lodgepole pine	24,500						

Township 20 South, Range 7 East.

This township lies east of the summit of the range, and consists mainly of rolling land, out of which a volcanic butte, known as Saddle Mountain, arises to an altitude of approximately 7,000 feet. The surface consists in the main of lava rock, with here and there a clay soil full of pumice stone.

The undergrowth is light, consisting of huckleberry, willow, alder, buck, and laurel brush, with some small lodgepole pines.

The timber consists chiefly of hemlock and lodgepole pine, which are of little value except for firewood. A few scattering yellow pines stand along the east line of the township. A large part of this township has been burned over, leaving standing only a little lodgepole pine.

The timber on this township can be logged eastward to the West Fork of Deschutes River, which during the winter season is a good logging stream.

Classification of lands and forest conditions in T. 20 S., R. 7 E.

Forested area	acres	11,650
Burned area	do	9,650
Water surface	do	1,600
Grass area	do	140
Total stand	feet B. M.	102,750,000
Average stand per acre	do	8,800
Litter		Light

Statistics of forest trees in T. 20 S., R. 7 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M. feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	54,500	74	16	12	2	5	176
Lovely fir	9,000	55	11	11	2	3	140
Yellow pine	5,750	114	27	18	2	5	188
White pine	3,000	120	22	22	1	4	170
Lodgepole pine	30,500						

Township 20 South, Range 8 East.

This township lies east of the range, and is on the plateau, with an average elevation of about 5,000 feet. The east and west parts of the township are somewhat broken, while the middle part is level, consisting of the valley of the West Fork of Deschutes River, which flows south across the township. In the southeastern part of the township is a large opening, a part of Crain Prairie, while in the central portion of the township is a small burned area comprising about half a section.

The soil consists of clay, with much pumice stone and lava rock.

The undergrowth is light, consisting of willow, buck, and laurel, with some small lodgepole pine.

The timber consists of yellow and lodgepole pine, in proportions of about two-thirds of the former to one-third of the latter. Yellow pine is found mostly on the east and west sides of the township, and about half of it is of good quality. Lodgepole pine is small and rough, and is of little value.

The timber on this township can be logged very cheaply to the West Fork of the Deschutes River, which is an excellent logging stream, at least during the spring floods.

Classification of lands and forest conditions in T. 20 S., R. 8 E.

Forested area	acres	21,840
Burned area	do	310
Grass area	do	890
Total stand	feet B. M.	142,000,000
Average stand per acre	do	6,500
Litter		Light.

Statistics of forest trees in T. 20 S., R. 8 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M. feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	95,000	115	29	27	3	8	206
Lodgepole pine	47,000						

Township 20 South, Range 9 East.

This township lies east of the range, well out upon the plateau, with an average elevation a little above 5,000 feet. The surface is mainly level or rolling.

The soil consists mainly of pumice stone, rock, and beds of lava.

The undergrowth is very light, consisting of huckleberry, laurel, manzanita, with a little young lodgepole pine. It is all open forest, with a heavy stand. It is of good quality, excepting on the high ground, where it is somewhat smaller and branchy and mixes with the growth of lodgepole pine.

With the exception of a small tract of timber on the west, this township can all be logged very cheaply to the Deschutes River to the eastward. This is a good logging stream at all seasons of the year.

Classification of lands and forest conditions in T. 20 S., R. 9 E.

Forested area	acres..	23,040
Total stand	feet B. M..	311,000,000
Average stand per acre	do....	13,500
Litter		Light.

Statistics of forest trees in T. 20 S., R. 9 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	9,000	64	15	9	2	5	151
Yellow pine	298,000	111	31	21	2	3	226
Lodgepole pine	4,000	.....	.....	.....	.....	.....	.....

Township 21 South, Range 1 East.

This township lies on the west side of the range, near its base, and consists of broken country, drained by Row River. The surface is rolling and broken.

The soil is red shot clay, stony on the ridges.

The undergrowth is dense, consisting of vine maple, hazel, rhododendron, salal, alder, huckleberry, salmon berry, soft maple, dogwood, yew, arrowwood, bearberry, and ferns, with young conifers.

The timber is nearly all red fir, and the stands are very heavy. Half of it is of good quality, while one-fourth of it is overripe and punky. There is a little hemlock and cedar, which are small in size but excellent in quality.

This township can be logged to Row River. This, however, is of no value for a logging stream in its present condition, as it has an insufficient water supply and low banks. Still there is a good route for a railroad up this valley, and probably it will be necessary to construct such a road in order to remove the timber.

Classification of lands and forest conditions in T. 21 S., R. 1 E.

Forested area	acres..	21,995
Burned area	do....	1,045
Total stand	feet B. M..	802,000,000
Average stand per acre	do....	36,400
Litter		Light.

A. DIVIDE BETWEEN ROW AND WILLAMETTE RIVERS.

B. RANCH IN THE RESERVE.

Statistics of forest trees in T. 21 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	756,000	184	37	14	6	26	207
Cedar	23,000	101	19	18	3	8	156
Hemlock	23,000	90	15	16	2	4	147

Township 21 South, Range 2 East.

This township lies upon the west slope of the range and includes a portion of the valley of the Willamette River, which flows across the northeast corner, and heavy mountain spurs upon the west. The surface is rugged and mountainous.

The soil is red shot clay, gravelly along Willamette River.

The undergrowth is dense, consisting of vine maple, alder, willow, hazel, soft maple, dogwood, chinquapin, salal, fern, laurel, huckleberry, with some young conifers.

The timber on this township consists almost entirely of red fir, which occurs in very heavy stands in the western part of the township, but in the eastern part 75 per cent of the timber is of poor quality, being overripe and punky, and has been damaged to a considerable extent by fire.

The western part of this township can be logged to Row River, which is of no value as a logging stream. The greater part of this township can be logged cheaply to the Willamette River, which is a good logging stream at most seasons of the year.

Classification of lands and forest conditions in T. 21 S., R. 2 E.

Forested area	acres..	22,190
Burned area	do....	850
Total stand	feet B. M..	455,000,000
Average stand per acre	do....	20,500
Litter		Light.

Statistics of forest trees in T. 21 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	400,000	169	33	34	7	40	192
Cedar	22,000	104	20	18	7	12	147
Hemlock	25,000	90	17	15	3	6	154
Lovely fir	1,500	100	18	16	2	4	140
White pine	6,500	100	14	13	2	3	128

Township 21 South, Range 3 East.

This township lies upon the west slope of the range and includes a section of the valley of Willamette River where it is joined by the North Fork, and Salmon, Salt, and Trout creeks. The surface is much broken with mountain spurs, except for the valley of the Willamette and the tributary streams and certain large prairies lying along the Willamette and between that stream and the North Fork. Altogether there is the equivalent of nearly three sections of open prairie, while the equivalent of nearly five sections has been burned over.

The soil consists of red shot clay, stony upon the ridges.

The undergrowth is dense, consisting of vine maple, hazel, scrub oak, willow, dogwood, arrowwood, yew, salal, soft maple, laurel, alder, cottonwood, ferns, huckleberry, and poison oak, with some young coniferous growth.

The timber consists chiefly of red fir, mostly of poor quality, since it is overripe and punky. About 20 per cent of the timber in this township is of second growth. There is a little cedar in the township. It is quite small, but otherwise of good quality.

The timber could be logged to the Willamette River, which is an excellent stream, except at the lowest stages of water.

Classification of lands and forest conditions in T. 21 S., R. 3 E.

Forested area	acres	18,200
Burned area	do	2,965
Grass area	do	1,875
Total stand	feet B. M.	115,000,000
Average stand per acre	do	6,000
Litter		Heavy.

Statistics of forest trees in T. 21 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	105,000	172	33	31	17	44	206
Cedar	10,000	110	23	19	9	9	162

Township 21 South, Range 4 East.

This township lies on the west side of the range and includes the point of the ridge separating Salmon from Salt Creek, including the valleys of these two streams. The land is in the main rugged and mountainous, and the soil is of red shot clay, very stony.

The undergrowth is dense on the creek bottoms but very light on the ridges. It consists of vine maple, huckleberry, alder, dogwood, chinquapin, laurel, hazel, willow, arrowwood, and manzanita, with small young conifers.

The timber consists mainly of red fir, with a little cedar. The stand is limited. but is of good quality in the valleys. On the ridges the timber, which is scanty, consists of hemlock and lovely fir, of little value for lumber.

The northern part of this township can be logged to Salmon Creek and that in the southern part to Salt Creek. Neither of these streams is in good logging condition, but railroads can easily be constructed up the valleys of both of them.

Classification of lands and forest conditions in T. 21 S., R. 4 E.

Forested area	acres	22,740
Burned area	do	300
Total stand	feet B. M.	322,500,000
Average stand per acre	do	14,100
Litter		Light.

Statistics of forest trees in T. 21 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	282,000	136	30	29	7	36	171
Cedar	32,250	44	22	18	5	10	154
Hemlock	4,750	75	13	11	5	14	153
Lovely fir	3,250	80	16	12	6	10	170
Sugar pine	250	220	48	60	2	5	250

Township 21 South, Range 5 East.

This township lies on the west slope of the range and consists of heavy spurs separating the branches of Salmon Creek with the valleys of the streams. The surface is rugged and mountainous.

The soil is a stony red clay.

The undergrowth is dense along the creek but light on the divides. It consists of huckleberry, salal, dogwood, vine maple, alder, yew, arrowwood, willow, laurel, manzanita, with young conifers.

The timber consists mainly of red fir in heavy stands along the branches of Salmon Creek; 25 per cent of it is of good quality. The remainder of the timber, consisting of cedar, hemlock, lovely fir, and white pine, is found mainly on the ridges, and is of fair quality.

This township can be logged to Salmon and Salt creeks by means of railroads to be constructed up those streams.

Classification of lands and forest conditions in T. 21 S., R. 5 E.

Forested area	acres	22,965
Grass area	do	75
Total stand	feet B. M.	295,000,000
Average stand per acre	do	12,800
Litter		Light.

Statistics of forest trees in T. 21 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	203,000	113	27	22	7	29	180
Cedar	28,250	83	21	15	3	14	167
Hemlock	39,000	74	16	13	3	7	162
Lovely fir	19,250	87	17	13	2	7	165
White pine	5,500	100	17	21	2	5	180

Township 21 South, Range 5½ East.

This fractional township, comprising 30 sections, lies upon the west slope of the range. Its surface is composed of heavy spurs stretching westward from the divide, separated by narrow-stream gorges.

The soil is red shot clay; stony along the ridges.

The undergrowth is dense in the creek valleys and light on the uplands, and consists of huckleberry, salal, yew, alder, dogwood, vine maple, and laurel, with young hemlock and cedar.

The timber consists chiefly of hemlock and lovely fir, with comparatively little red fir in the valleys. The hemlock and lovely fir are of poor quality, while the red fir, although limited in amount, is excellent.

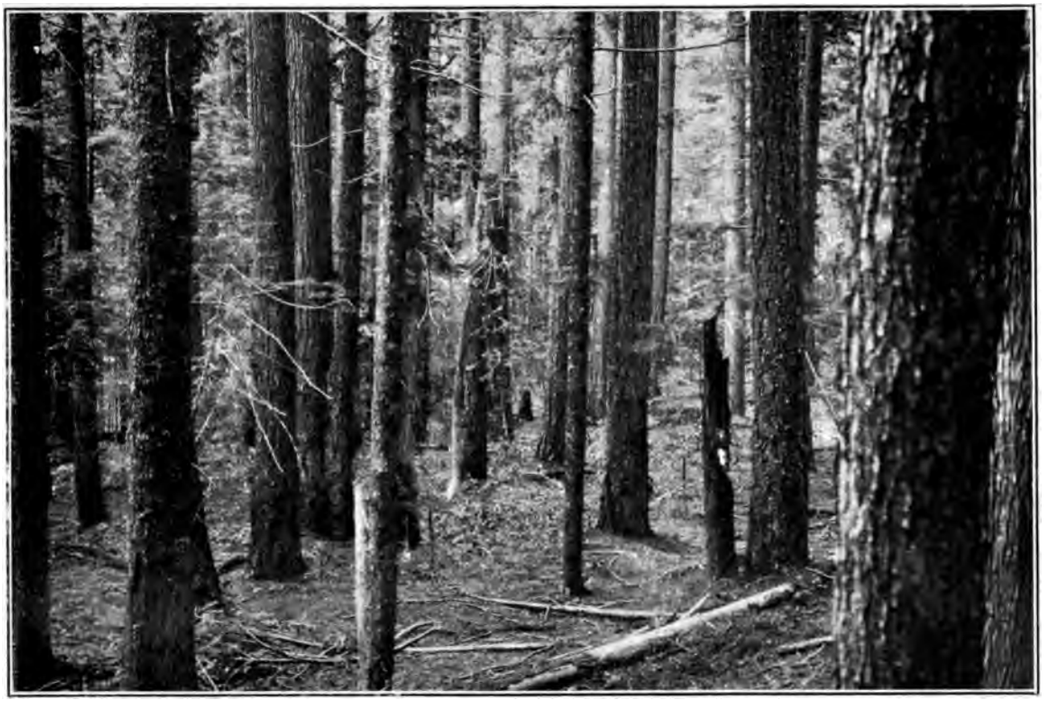
This township, with the exception of a small tract along the east line, can be logged down Salmon Creek, a tributary to the Willamette. In its present condition, however, it is of little or no value for driving purposes, since at ordinary stages it has insufficient water and is too rapid.

Classification of lands and forest conditions in T. 21 S., R. 5½ E.

Forested area	acres..	17,275
Burned area	do....	1,380
Water surface	do....	545
Total stand	feet B. M..	293,500,000
Average stand per acre	do....	17,000
Litter		Light.

Statistics of forest trees in T. 21 S., R. 5½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	46,750	131	27	23	5	24	161
Hemlock	122,500	75	17	13	6	17	165
Noble fir	2,750	94	20	16	2	5	175
Lovely fir	107,750	70	15	13	4	9	170
White pine	13,750	110	20	21	1	5	176



A. FIR AND HEMLOCK ON BENCH ON NORTH FORK OF WILLAMETTE RIVER.

B. KITSONS HOT SPRINGS.

Township 21 South, Range 6 East.

This township is traversed by the divide of the Cascade Range. Its surface is mainly rolling, rising here and there into volcanic buttes. The western part is largely occupied by Lake Waldo.

The surface is in great part covered by basalt rocks, with here and there a clay soil full of pumice stone.

The undergrowth is light, consisting of huckleberry, willow, alder and laurel brush, with small pines and hemlocks.

The timber consists chiefly of hemlock, which is short and scrubby and of little value for lumber. There is a little lodgepole pine, which also is of no value, and a few scattering trees of white pine of good quality.

The timber on the east can be logged to Deschutes River, while on the west side of the range it can be taken down the North Fork of Willamette River. In this township this stream is of no value for logging purposes in its present condition.

Classification of lands and forest conditions in T. 21 S., R. 6 E.

Forested area	acres	21,920
Water surface	do	1,120
Total stand	feet B. M.	222,000,000
Average stand per acre	do	10,000
Litter		Light.

Statistics of forest trees in T. 21 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	3,750	133	36	25	3	6	193
Hemlock	172,250	64	17	9	2	5	183
Lovely fir	16,000	77	15	16	1	3	163
White pine	11,250	91	22	18	1	2	194
Lodgepole pine	18,750	53	9	.....	2	3	126

Township 21 South, Range 7 East.

This township, lying east of the crest of the range, has a steeply rolling surface on the west, becoming more gentle in the eastern part of the township, and contains several volcanic buttes. The surface is composed almost entirely of basalt rock and pumice stone.

The undergrowth is very light, consisting of laurel, willow, and huckleberry, with some small pine trees.

Nearly all the timber consists of yellow pine. Perhaps one fourth of it is of good quality, the balance being rough and scrubby. There is a small amount of hemlock and lodgepole pine, but these species are of no value for lumber.

The township can be logged east to the West Branch of Deschutes River, which is a good logging stream during the winter and spring. The exploitation of the timber of this township will be a cheap matter.

Classification of lands and forest conditions in T. 21 S., R. 7 E.

Forested area	acres	15,090
Burned area	do	7,310
Grass area	do	510
Water surface	do	30
Total stand	feet B. M.	132,250,000
Average stand per acre	do	8,700
Litter		Light.

Statistics of forest trees in T. 21 S., R. 7 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	6,000	63	15	9	3	5	168
Yellow pine	117,000	122	30	18	2	4	224
Lodgepole pine	9,250						

Township 21 South, Range 8 East.

This township lies east of the summit and well down the slope of the range. It consists in part of a level plateau and in part of broken volcanic country, with several extinct volcanoes scattered about it. In the northwest corner is a tract of level, open country known as Crain Prairie. The range is drained by the West Fork of Deschutes River.

The soil is of clay, with much pumice stone and basalt rock.

The undergrowth is light, consisting of willow, hemlock, laurel, and alder, with some young lodgepole pine.

The timber consists entirely of yellow pine growing in an open, but suprisingly heavy stand. The only other timber upon the township consists of a small growth of lodgepole pine scattered about the margin of Crain Prairie.

This township can be logged very cheaply to the West Fork of Deschutes River.

Classification of lands and forest conditions in T. 21 S., R. 8 E.

Forested area	acres	20,630
Burned area	do	810
Grass area	do	1,610
Total stand	feet B. M.	352,500,000
Average stand per acre	do	17,000
Litter		Light.

Statistics of forest trees in T. 21 S., R. 8 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	352,500	121	32	19	2	4	224

Township 21 South, Range 9 East.

This township lies upon the plateau east of the range, and has a level or gently rolling surface with a general eastward slope. It is largely covered with basalt rock. Wherever there is soil it consists of clay with a good deal of pumice stone.

The undergrowth is very light, consisting of laurel, willow, and alder, with young pine trees.

The timber consists almost entirely of yellow pine of excellent quality in very heavy stands. It has a little scattered lodgepole pine among the yellow pine, which is the only other species represented.

The timber can be gotten out very cheaply to the West Fork of Deschutes River, which is an excellent logging stream.

Classification of lands and forest conditions in T. 21 S., R. 9 E.

Forested area	acres..	22,890
Grass area	do....	150
Total stand	feet B. M..	403,000,000
Average stand per acre	do....	17,600

Statistics of forest trees in T. 21 S., R. 9 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	397,000	130	32	24	1	3	237
Lodgepole pine	6,000	.....	.....	.....	.....	.....	.....

Township 22 South, Range 1 East.

This township lies on the west side of the range, near its base. Its surface consists of broken hills, through which flows Frank Brass Creek, which drains nearly all the township.

The soil is red shot clay, quite stony on the divides.

The undergrowth is dense, consisting of soft maple, vine maple, salal, huckleberry, alder, rhododendron, willows, and ferns, with some young fir.

The timber consists chiefly of red fir, 50 per cent of which is of good quality, the balance being rough and scrubby. The stands are very heavy on this

township. The hemlock and cedar are of good quality, but small in size and somewhat scattered.

With the exception of a small tract on the southwest corner and along the north line, this township can be logged to Frank Brass Creek, a branch of Row River. The stream is, however, of no value as a logging stream, as it has insufficient water for driving purposes and low banks. It will be necessary to build a railroad through this township for the purpose of moving the timber, and this can be done along the valley of Frank Brass Creek. Surveys for this are now in progress, to connect the Bohemia mining district with the Southern Pacific Railroad.

Classification of lands and forest conditions in T. 22 S., R. 1 E.

Forested area	acres	19,500
Burned area	do	3,540
Total stand	feet B. M.	625,750,000
Average stand per acre	do	32,000
Litter		Light.

Statistics of forest trees in T. 22 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	509,500	176	36	41	7	25	222
Cedar	64,000	114	21	17	7	7	161
Hemlock	52,250	97	17	16	3	4	152

Township 22 South, Range 2 East.

This township is situated upon the west slope of the range, near its base, and consists of mountainous or hilly country.

The soil is of red shot clay, very stony on the divides.

The undergrowth is dense, consisting of vine maple, yew, alder, laurel, hemlock, salal, dogwood, and soft maple, with young firs and hemlocks.

The timber is chiefly red fir, 25 per cent of which is of good quality, the rest being rather scrubby. There is a little cedar and white pine, which is of small size, but of good quality. The hemlock and lovely fir are scrubby.

This township can be logged to the westward down Frank Brass Creek, a branch of Row River, with the exception of a small tract along the east line of the township, which can be logged east to Willamette River. Frank Brass River is not drivable, and it will be necessary to build a railroad up this valley to get out the timber. At present a survey is being made for a railroad from Cottage Grove to the Bohemia mining district, following up the valley of this stream.

A. LAKE CRESCENT.

B. HOT SPRINGS.

Classification of lands and forest conditions in T. 22 S., R. 2 E.

Forested area	acres..	23,040
Total stand	feet B. M..	586,500,000
Average stand per acre	do....	25,400
Litter		Light.

Statistics of forest trees in T. 22 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	448,000	162	33	35	4	23	201
Cedar	42,000	112	20	16	5	8	166
Hemlock	55,500	93	18	14	2	5	155
Lovely fir	16,500	87	13	16	2	5	152
White pine	24,500	112	19	23	2	5	181

Township 22 South, Range 3 East.

This township lies upon the west slope of the range, and includes the valley of Willamette River, with the ridges upon either side. The surface is steeply rolling, with the exception of a narrow, level bottom along the river.

The soil is red shot clay, stony on the ridges and gravelly along the river.

The undergrowth is dense, consisting of vine maple, cottonwood, willow, yew, huckleberry, alder, salal, elder, dogwood, soft maple, chinquapin, laurel, manzanita, and ferns, with young firs, hemlocks, and cedars.

The timber is chiefly composed of red fir of heavy stand, 30 per cent of which is good quality, the best stand being found in the valley of the Willamette. The cedar timber is of excellent quality. A few scattered sugar pines are found along the Willamette River and its branches.

All the timber in this township can be logged to Willamette River, which is a good logging stream at most seasons of the year. Probably 50 per cent of the timber in the township can be taken out very cheaply.

Classification of lands and forest conditions in T. 22 S., R. 3 E.

Forested area	acres..	23,040
Total stand	feet B. M..	487,500,000
Average stand per acre	do....	21,100
Litter		Light.

Statistics of forest trees in T. 22 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	419,000	177	27	40	6	34	189
Cedar	58,000	142	27	21	5	11	170
Hemlock	7,500	80	13	11	2	5	152
Sugar pine	3,000	192	38	62	2	5	208

Township 22 South, Range 4 East.

This township lies upon the west slope of the range, and includes the valley of Trout Creek, with the ridges upon either side. Its surface is rugged and mountainous.

The soil is red shot clay, very stony on the ridges.

The undergrowth is light, consisting of young conifers, with laurel, vine maple, arrowwood, yew, manzanita, chinquapin, alder, cottonwood, elderberry, and salal.

The timber consists in the main of red fir, which is of poor quality, excepting in the immediate valley of the creek, where it is good. The other species are found on the ridges, and are scrubby and of poor quality.

Most of the timber standing on this township can be logged down Trout Creek, a branch of the Willamette; that in the southeast corner will naturally go to Salt Creek, and that along the west line directly to the Willamette.

Classification of lands and forest conditions in T. 22 S., R. 4 E.

Forested area	acres..	23,040
Total stand	feet B. M..	344,500,000
Average stand per acre	do....	14,950
Litter		Light.

Statistics of forest trees in T. 22 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	186,000	111	25	32	3	48	186
Cedar	13,500	92	17	16	2	10	170
Hemlock	114,500	84	17	14	2	12	165
Lovely fir	25,000	85	17	14	2	5	170
White pine	5,500	100	20	18	2	5	180

Township 22 South, Range 5 East.

This township lies upon the west slope of the range, and includes a section of the valley of Salt Creek, with the mountain spurs on either side, consisting mainly of rugged, mountainous country.

The soil is red shot clay, very stony on the ridges.

The undergrowth is light, consisting of young conifers, with vine maple, yew, dogwood, huckleberry, laurel, manzanita, chinquapin, alder, and salal.

The timber is heavy, especially in the valleys, consisting in the main of red fir, with a large amount of hemlock and some lovely fir. The red fir stands are very heavy in the valley of Salt Creek, and one-fourth of it is of excellent quality. The

Classification of lands and forest conditions in T. 22 S., R. 5½ E.

Forested area	acres..	17,510
Water surface	do....	295
Burned area	do....	1,395
Total stand	feet B. M..	311,750,000
Average stand per acre	do....	17,800
Litter		Light.

Statistics of forest trees in T. 22 S., R. 5½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	28,500	134	27	24	4	23	151
Hemlock	202,500	91	19	15	3	8	164
Noble fir	1,500	100	22	21	2	5	170
Lovely fir	71,000	82	15	14	2	6	160
White pine	9,500	115	21	21	1	5	162

Township 22 South, Range 6 East.

This township includes the summit of the range. The surface is rugged and mountainous, rising in the north in the summit known as The Twins and in the south in Maiden Peak. In the southwestern part of the township are the headwaters of Salt Creek, while Waldo Creek breaks into the northwest corner.

The soil is clay with much pumice stone, which is especially abundant upon the higher land.

The undergrowth is light, excepting near the lake shores. It consists of alder, salal, rhododendron, buckthorn, manzanita, huckleberry, and chinquapin, with young conifers.

The timber consists chiefly of hemlock, nearly all of which is of poor quality. There is a little white pine of good quality, and a little spruce around the lake shore.

It would be quite difficult and expensive to get the timber out of this township, inasmuch as all operations would necessarily be dependent upon railroads to be built, as the streams are too small to be of use for driving purposes.

Classification of lands and forest conditions in T. 22 S., R. 6 E.

Forested area	acres..	20,585
Burned area	do....	1,060
Grass area	do....	380
Water surface	do....	1,015
Total stand	feet B. M..	390,750,000
Average stand per acre	do....	19,400
Litter		Light.

A. LAKE CRESCENT.

B. OUTLET OF LAKE ODELL. MAIDEN PEAK IN THE DISTANCE.

Statistics of forest trees in T. 22 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	5,250	138	28	25	4	27	180
Hemlock	346,500	103	18	15	2	4	189
Spruce	1,500	132	19	17	1	5	167
Noble fir	750	125	20	20	1	5	170
Lovely fir	23,000	95	13	13	1	3	165
White pine	10,250	126	13	25	1	5	163
Lodgepole pine	3,250						

Township 22 South, Range 7 East.

This township lies east of the summit of the range, and comprises its eastern slopes and a portion of the plateau. In the southeastern corner is a part of Davis Lake, the headwaters of the West Fork of Deschutes River. The surface is steeply rolling in the western part, while the eastern half of the township is comparatively level.

Lava beds and pumice stone take the place of soil.

The undergrowth is very light, consisting of young lodgepole pine, with alder, manzanita, willow, and huckleberry.

The timber consists chiefly of yellow pine, with a little lodgepole pine in rather light stand. Perhaps 40 per cent of the timber is of good quality, the balance being rough and scrubby.

The township can be logged very easily to the West Fork of Deschutes River.

Classification of lands and forest conditions in T. 22 S., R. 7 E.

Forested area	acres	21,105
Grass area	do	475
Water surface	do	1,460
Total stand	feet B. M.	130,000,000
Average stand per acre	do	6,100
Litter		Light.

Statistics of forest trees in T. 22 S., R. 7 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	116,500	111	29	19	2	6	210
Lodgepole pine	13,500						

Township 22 South, Range 8 East.

This township lies upon the plateau east of the range, and is drained by the West Fork of Deschutes River. The surface is steeply rolling in the southern part, changing to level or gently rolling in the north. It consists of lava beds and pumice stone.

The undergrowth is very light, consisting of manzanita, willow, huckleberry, alder, and laurel, with some young lodgepole pine.

The timber is almost entirely yellow pine, 40 per cent of which is of good quality. The rest is somewhat rough and scrubby. There is a little scattering lodgepole pine, which has no lumber value.

This township can be logged northeastward to the West Fork of Deschutes River, which is a good logging stream during the winter and spring.

Classification of lands and forest conditions in T. 22 S., R. 8 E.

Forested area	acres..	22,950
Water surface	do....	90
Total stand	feet B. M..	334,000,000
Average stand per acre	do....	14,100
Litter		Light.

Statistics of forest trees in T. 22 S., R. 8 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	332,000	121	30	20	3	5	220
Lodgepole pine	2,000						

Township 22 South, Range 9 East.

This township lies on the east side of the range, well out upon the plateau. Most of the land lies between the East and West forks of Deschutes River, which cross respectively the southeast and northwest corners of the township. The surface is steeply rolling along the divide, but the balance of the land is quite level.

The soil is clay along the river bottoms, but largely pumice stone upon the plateau between the rivers.

The undergrowth is light, consisting of small lodgepole pine, willow, manzanita, laurel, and huckleberry.

The timber consists chiefly of yellow pine in tolerably heavy stand, 30 per cent of it being of good quality. It is found mainly in the western part and along the divide between the branches of the Deschutes. The lodgepole pine, of which there is a little in the township, is small and is of no value except for firewood and fence poles. Most of the bottom land of the river has been cleared for raising hay, while the upland is used for grazing purposes.

This township can be logged easily to the two forks of the Deschutes, both of which are good driving streams.

Classification of lands and forest conditions in T. 22 S., R. 9 E.

Forested area	acres	22,125
Bottom land	do	915
Total stand	feet B. M.	228,000,000
Average stand per acre	do	10,300

Statistics of forest trees in T. 22 S., R. 9 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	216,250	120	28	21	3	8	156
Lodgepole pine	11,750	.....	.....	.....	.....	.....	.....

TOWNSHIP 23 SOUTH, RANGE 1 EAST.

This township lies upon the west slope of the range, near its base, and includes the Bohemia mining district, which is near the summit of the Calapooya Range. The surface is all steep, rugged, and broken.

The soil is of red shot clay, very stony on the mountains and divides.

The undergrowth is dense along creek bottoms, but light on the uplands, where it has been pretty thoroughly burned. It consists of vine maple, rhododendron, salal, huckleberry, alder, elderberry, dogwood, and ferns, with young conifers.

Most of the area of this township was burned many years ago. While most of the timber was destroyed, it still contains small amounts of merchantable timber which survived the fire. The standing timber consists chiefly of red fir, all of fair quality, with the exception of that in the creek bottoms, where there is a little of good quality. On the divides and ridges all the timber is small and scrubby.

Nearly all this township has been staked off into mining claims.

The timber on this township will be very difficult and expensive to log, as none of the streams in or near this township, and accessible to the timber, are drivable, as they are too shallow and rapid for this purpose. It is probable, however, that owing to the presence of the mines there will be ample local demand for the timber of the neighborhood.

Classification of lands and forest conditions in T. 23 S., R. 1 E.

Forested area	acres	8,100
Burned area	do	24,940
Total stand	feet B. M.	156,750,000
Average stand per acre	do	19,300
Litter		Heavy.

Statistics of forest trees in T. 23 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	148,000	142	29	29	17	29	187
Hemlock	4,375	67	15	14	3	7	158

Township 23 South, Range 2 East.

This township lies on the west slope of the range, and includes a part of the Calapooya Mountains. The surface is steep and mountainous.

The soil is red shot clay, stony on the ridges.

The undergrowth is dense near the creeks, light on the uplands and ridges, and consists of vine maple, alder, hazel, yew, arrowwood, manzanita, chinquapin, dogwood, soft maple, huckleberry, and salal, with some young conifers.

The timber consists chiefly of red fir of good quality in the valleys, while on the ridges it becomes short and scrubby. With the exception of sugar and white pines, which, although few in number, are of good quality, the species are of little value.

On the east side of the Calapooya Mountains this township can be logged eastward to Willamette River. The south and west parts of the township will have to be logged down a branch of North Umpqua, which at present is of no value for logging purposes.

Classification of lands and forest conditions in T. 23 S., R. 2 E.

Forested area	acres	21,000
Burned area	do	610
Grass area	do	1,430
Total stand	feet B. M.	265,250,000
Average stand per acre	do	12,500
Litter		Light.

Statistics of forest trees in T. 23 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	191,000	137	27	21	7	27	197
Cedar	14,000	84	17	12	5	13	151
Hemlock	24,250	73	13	11	4	8	147
Lovely fir	29,500	90	15	12	3	6	157
Sugar pine	750	175	36	48	1	2	200
White pine	5,750	112	22	18	2	4	167

A. BOHEMIA MOUNTAIN.

B. VIEW FROM GRASS MOUNT, SHOWING CALAPOOYA RANGE.

Township 23 South, Range 3 East.

This township, on the west side of the range, includes the valley of Willamette River, here quite narrow, with mountain ridges on the two sides. The surface is in the main steep and rugged, with the exception of narrow strips of level land along the river.

The soil consists of red shot clay, which becomes quite stony on the ridges.

The undergrowth is dense, consisting of vine maple, laurel, dogwood, arrowwood, hazel, chinquapin, alder, cottonwood, manzanita, yew, soft maple, huckleberry, willow, and salal, with some young conifers.

The timber, which is heavy, consists almost entirely of red fir, which grows in fine, heavy stands in the valley of the Willamette and on the lower slopes of the ridges. Perhaps half of this timber is of good quality. There is a small stand of cedar, which is of very good quality, and there are scattering trees of incense cedar and sugar pine, which are large and clear and furnish excellent lumber.

This township can be logged to Willamette River, which at most seasons of the year is an excellent logging stream. Half the timber in the township can be logged thus very cheaply, while the balance of the timber will be expensive to handle, as chutes will have to be built to convey it to the river.

Classification of lands and forest conditions in T. 23 S., R. 3 E.

Forested area	acres	20,640
Grass area	do	2,400
Total stand	feet B. M.	450,250,000
Average stand per acre	do	21,800
Litter		Light.

Statistics of forest trees in T. 23 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	392,000	178	33	38	3	30	193
Cedar	27,750	98	23	20	3	13	179
Incense cedar	2,250	150	32	50	4	8	229
Hemlock	9,500	98	13	12	2	5	144
Lovely fir	1,000	90	16	20	2	5	170
Sugar pine	4,500	192	44	72	1	5	260
Yellow pine	9,500	140	30	34	2	5	216
White pine	3,750	122	26	21	2	5	162

Township 23 South, Range 4 East.

This township lies on the west slope of the range, and comprises the summit of a broad spur north of the Willamette. The surface is in the main steep and rugged.

The soil consists of red shot clay, full of lava bowlders.

The undergrowth is light, consisting of vine maple, huckleberry, laurel, yew, arrowwood, willow, manzanita, alder, and dogwood, with some young conifers.

The timber consists chiefly of red fir, growing in heavy stands, 30 per cent of it being of good quality, but with a large proportion diseased. The timber of other species is for the most part of poor quality, with the exception of white pine, which, though small in amount, is of great value.

The northeast corner of this township can be logged to Trout Creek, a branch of Willamette River, while the remainder of the township can be logged to the river itself, which at all times of the year is an excellent logging stream.

Classification of lands and forest conditions in T. 23 S., R. 4 E.

Forested area	acres	20,180
Water surface	do	20
Burned area	do	430
Grass area	do	2,410
Total stand	feet B. M.	579,250,000
Average stand per acre	do	28,700
Litter		Light.

Statistics of forest trees in T. 23 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	277,000	127	26	34	5	43	196
Hemlock	198,000	86	16	16	.....	8	172
Noble fir	8,000	100	20	20	.....	5	180
Lovely fir	70,500	100	17	18	.....	5	180
Sugar pine	250	200	48	60	.....	5	275
Yellow pine	2,000	150	36	40	.....	10	225
White pine	29,500	100	20	24	.....	5	180

Township 23 South, Range 5 East.

This township lies upon the west side of the range and near its summit, comprising a broad spur on the north of the Willamette, with the valleys of Trout and Glacier creeks. The surface is rugged and broken.

The soil is very stony, red shot clay.

The undergrowth is light, consisting of huckleberry, salal, yew, alder, vine maple, dogwood, cottonwood, laurel, chinquapin, and manzanita, with some young conifers.

The timber is of several species of red fir, the stands of which are quite heavy in the creek valleys, and about one-fourth of it is of excellent quality. In the burns

along the divides the timber consists of hemlock, lovely fir, and white pine, one-fifth of which is of good quality, but the balance is small and scrubby. On the north side of the divide the township can be logged to Trout Creek, while the southern portion can be logged to Willamette River.

Classification of lands and forest conditions in T. 23 S., R. 5 E.

Forested area	acres..	22,520
Grass area	do....	520
Total stand	feet B. M..	500,000,000
Average stand per acre	do....	22,200
Litter		Light.

Statistics of forest trees in T. 23 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	152,000	125	26	32	.....	40	191
Hemlock	177,000	88	16	16	.....	8	165
Lovely fir	83,000	80	17	17	.....	5	180
White pine	28,000	100	20	24	.....	5	180

Township 23 South, Range 5½ East.

This fractional township, consisting of thirty sections, includes the summit of the Cascade Range, which here is rugged and broken.

The soil is very stony, consisting of clay, with much pumice stone interspersed through it.

The undergrowth is very light, consisting of laurel, yew, and huckleberry, with some young firs and hemlocks.

With the exception of a little red fir along Salt Creek, on the east of the divide, the timber consists of hemlock, lovely fir, and lodgepole pine of such quality as to render them practically worthless. There is a little scattered white pine and other timber of good quality on the west side of the range.

On the west side this can be logged down Salt Creek, while on the east side it can go to Odell Lake, in the adjoining township.

Classification of lands and forest conditions in T. 23 S., R. 5½ E.

Forested area	acres..	19,200
Total stand	feet B. M..	158,250,000
Average stand per acre	do....	8,200
Litter		Light.

Statistics of forest trees in T. 23 S., R. 5½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	30,750	138	30	20	5	23	172
Hemlock	64,250	75	16	12	4	16	177
Noble fir	2,500	126	21	17	2	5	173
Lovely fir	30,500	88	16	12	2	5	167
White pine	16,500	126	21	16	1	4	180
Lodgepole pine	13,750						

Township 23 South, Range 6 East.

This township includes a portion of the summit of the range. Its surface is steeply rolling and broken, with a number of volcanic mountains and buttes. It contains Odell Lake, 5 miles in length, with an average of nearly a mile in breadth.

The soil is of clay, with much pumice stone, especially on the ridges.

The undergrowth is light, consisting of young conifers, with alder, laurel, vine maple, and huckleberry.

The altitude being great, ranging from 5,000 to 7,000 feet, the timber consists chiefly of hemlock and lodgepole pine, with a sprinkling of other species. The timber is of little value, except for firewood and fencing.

The timber on this township can be logged eastward to the West Fork of Deschutes River, with the exception of a small tract west of the summit, which can be logged down Salt Creek, a branch of the Willamette.

Classification of lands and forest conditions in T. 23 S., R. 6 E.

Forest area	acres	18,985
Burned area	do	135
Grass area	do	190
Water surface	do	3,730
Total stand	feet B. M	99,500,000
Average stand per acre	do	5,240
Litter		Light.

Statistics of forest trees in T. 23 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	7,500	149	30	20	3	21	182
Hemlock	46,000	76	14	12	2	6	170
Spruce	5,000	121	16	13	2	3	160
Noble fir	2,000	125	21	17	3	3	160
Lovely fir	14,500	81	14	12	3	5	156
White pine	6,000	129	20	17	2	5	169
Lodgepole pine	18,500						

Township 23 South, Range 7 East.

This township lies east of the crest of the range, and includes a portion of the plateau at its base. Its surface is mainly level, rising steeply on the west, and is broken by two or three volcanic cones. In the northeastern corner is the southern half of Davis Lake.

The soil is mainly pumice stone and lava rocks.

The undergrowth is very light, consisting of young pines, manzanita, buck brush, alder, willow, and ferns.

The timber consists mainly of yellow pine in fair stands, with some lodgepole pine. The yellow pine is mainly in the eastern portion of the township, and half of it, at least, is of good quality.

The timber on this township can be logged into Davis Lake and thence down to the West Fork of Deschutes River. Logging operations will here be very cheap.

Classification of lands and forest conditions in T. 23 S., R. 7 E.

Forested area	acres	19,100
Burned area	do	1,420
Grass area	do	465
Water surface	do	2,055
Total stand	feet B. M.	144,250,000
Average stand per acre	do	7,500
Litter		Light.

Statistics of forest trees in T. 23 S., R. 7 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	4,250	66	14	9	3	7	156
Yellow pine	110,000	108	24	16	3	6	217
Lodgepole pine	30,000	.....	.....	.....	.....	.....	.....

Township 23 South, Range 8 East.

This township, lying upon the east side of the divide, has, in the main, a gently rolling surface, but is broken by several steep volcanic hills rising to considerable elevations. The altitude ranges from 5,000 feet, as the general level of the plateau, up to 8,000 feet on the highest summit. The surface consists largely of volcanic rock.

Wherever there is soil it consists of clay, interspersed with much pumice stone.

The undergrowth is very light, consisting of manzanita, laurel, willow, and huckleberry, with some young lodgepole pines.

The timber consists almost entirely of yellow pine in heavy stands, 40 per cent of it being of good quality. On the higher ground is found a small amount of lodgepole pine and hemlock, but these are of no value for lumber.

The western part of this township can be logged most advantageously to the West Fork of Deschutes River, while the eastern part can be logged very cheaply to the East Fork of the same stream.

Classification of lands and forest conditions in T. 23 S., R. 8 E.

Forested area	acres..	22,840
Burned area	do....	200
Total stand	feet B. M..	447,000,000
Average stand per acre	do....	10,800
Litter		Light.

Statistics of forest trees in T. 23 S., R. 8 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	447,000	123	29	19	1	2	250

Township 23 South, Range 9 East.

This township lies upon the east side of the range, well out upon the plateau. It is traversed from south to north by the East Fork of Deschutes River. The surface is level or gently sloping.

The soil consists of clay in the river bottom land, and mainly of pumice stone upon the upland.

The undergrowth is very light, consisting of small lodgepole pine, with willow, manzanita, laurel, and alder.

The stand of timber is everywhere light, consisting chiefly of lodgepole pine of no value for lumbering purposes, with a thinly scattered growth of yellow pine, one-fourth of which only is of good quality. A large part of this township was burned many years ago and the timber destroyed. The little timber which is found in this township can be logged to the East Fork of Deschutes River, which is a good driving stream.

Nearly all the timber along the river bottom has been cleared and fenced for raising hay. It is nearly all in one ranch, the cattle from which range upon the upland in the summer time.

Classification of lands and forest conditions in T. 23 S., R. 9 E.

Forested area	acres..	18,630
Burned area	do....	3,120
Bottom land	do....	1,290
Total stand	feet B. M..	71,500,000
Average stand per acre	do....	3,800

A. FISH LAKE AND HILLS NORTH OF MOUNT THIELSEN.

B. DIVIDE BETWEEN ROW RIVER AND MIDDLE FORK OF WILLAMETTE RIVER.

Statistics of forest trees in T. 23 S., R. 9 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Yellow pine	53,500	108	26	20	4	9	209
Lodgepole pine	18,000	50	8	.....	.....	.....	.....

Township 24 South, Range 1 East.

This township lies on the west slope of the range near its base. It consists of a high, broad, mountain mass, sloping from an elevation of about 5,500 feet down to 3,000 feet. Its surface is steep, rugged, and broken.

The soil is of red shot clay, which is quite stony on the divides.

The undergrowth is light, consisting of young conifers, with vine maple, huckleberry, salal, yew, arrowwood, laurel, chinquapin, manzanita, and ferns.

The timber is chiefly red fir, 30 per cent of it of good quality. Of the other species, the hemlock and white pine are small and scrubby.

This township can be logged eastward to Steamboat Creek and westward to McKinley Creek, both of these streams being branches of the North Fork of Umpqua River. Neither stream is of any value as a logging stream in their present condition, as they are small and have low banks.

Classification of lands and forest conditions in T. 24 S., R. 1 E.

Forested area	acres..	22,240
Burned area	do....	800
Total stand	feet B. M..	440,750,000
Average stand per acre	do....	22,240
Litter		Light.

Statistics of forest trees in T. 24 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	374,000	139	27	23	6	40	203
Hemlock	58,500	80	15	16	5	10	150
White pine	8,250	100	18	20	.....	10	170

Township 24 South, Range 2 East.

This township, lying well down the west slope of the range, includes a part of the Calapooya Range, a heavy mountain spur lying west of the Willamette. The surface is steeply rolling and broken.

The soil is red shot clay, stony on the ridges.

The undergrowth is light, consisting of young conifers, with yew, vine maple, alder, huckleberry, chinquapin, laurel, dogwood, and salal.

The timber consists mainly of red fir in heavy stands, especially along the streams, and about 40 per cent of it is of good quality. The timber on the divides is small and scrubby, although the cedar and white pine in such localities are good.

This township can all be logged to what is known as Steamboat Creek, a branch of the North Fork of Umpqua River. The stream is of no value, however, for logging purposes, as it has not sufficient water. Still a railroad can be built along the banks of this stream in the township at comparatively light expense.

Classification of lands and forest conditions in T. 24 S., R. 2 E.

Forested area	acres	23,000
Grass area	do	40
Total stand	feet B. M.	543,500,000
Average stand per acre	do	23,630
Litter		Light.

Statistics of forest trees in T. 24 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	455,000	149	27	23	.....	25	188
Cedar	15,000	120	23	20	.....	10	180
Hemlock	67,000	80	14	16	.....	10	143
White pine	6,500	100	24	30	.....	10	180

Township 24 South, Range 3 East.

This township lies upon the west slope of the range, and includes a section of the valley of the Willamette River, with the mountain spurs upon either side, reaching on the west to the summit of the Calapooya Range. The country is in the main steep and rugged, with the exception of the narrow valley of Willamette River.

The soil is clay and commonly very stony.

The underbrush is light, consisting of young conifers, with vine maple, alder, laurel, manzanita, yew, arrowwood, huckleberry, cottonwood, willow, and ferns.

There is a considerable area of open country east of the river, and there are also two small tracts in the southwest corner. With these two exceptions, the township is timbered throughout. The timber consists mainly of red fir, with considerable hemlock, and some noble and lovely fir, and yellow and white pine. The total stand of timber is heavy. The timber in the valley is of excellent quality, while that high upon the ridges is small and scrubby.

This township can be logged to Willamette River (which is an excellent logging stream), with the exception of a small tract along the west line of the township, which will have to go down a branch of Willamette River.

Classification of lands and forest conditions in T. 24 S., R. 3 E.

Forested area	acres	20,160
Grass area	do	2,880
Total stand	feet B. M.	484,500,000
Average stand per acre	do	24,000
Litter		Light.

Statistics of forest trees in T. 24 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	299,500	155	27	33	.....	41	208
Cedar	250	100	20	16	.....	10	160
Incense cedar	5,250	125	24	20	.....	20	200
Hemlock	96,500	75	15	14	.....	8	165
Noble fir	23,500	100	20	20	.....	5	180
Lovely fir	21,000	100	20	18	.....	5	180
Sugar pine	500	250	40	70	.....	5	250
Yellow pine	26,250	171	30	50	.....	10	200
White pine	11,750	94	15	14	.....	16	172

Township 24 South, Range 4 East.

This township lies upon the west slope of the range and includes a section of the valley of the Willamette, with spurs upon either side. Its surface, with the exception of the river valley, is steep and mountainous.

The soil is red shot clay, very stony upon the ridges.

The undergrowth is dense along the river and light on the ridges. It consists of vine maple, alder, willow, cottonwood, hazel, dogwood, arrowwood, huckleberry, salal, yew, and ferns, with young conifers.

The timber is very heavy, consisting in the main of red fir, which is especially heavy in the Willamette Valley. Perhaps 30 per cent of this species is of good quality, with a large proportion diseased. There is a small amount of cedar, which, however, is of good quality, and a little sugar and yellow pine.

This township can all be logged to Willamette River, and half of it can be logged very cheaply, as it is quite accessible. Willamette River is a good logging stream at nearly all seasons of the year.

Classification of lands and forest conditions in T. 24 S., R. 4 E.

Forested area	acres..	22,120
Burned area	do....	920
Total stand	feet B. M..	689,250,000
Average stand per acre	do....	31,100
Litter		Light.

Statistics of forest trees in T. 24 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	487,000	172	32	38	.....	40	206
Cedar	5,500	100	20	18	.....	20	180
Incense cedar	5,750	125	26	21	.....	20	206
Hemlock	148,000	79	15	14	.....	8	160
Noble fir	18,000	100	20	20	.....	5	180
Sugar pine	1,500	200	40	50	.....	10	250
Yellow pine	11,000	150	36	32	.....	20	225
White pine	12,500	100	20	24	.....	5	180

Township 24 South, Range 5 East.

This township lies just west of the summit of the range, with Diamond Peak near its northeast corner. It contains a section of the upper valley of Willamette River, which flows across the township from southeast to northwest. Its surface is nearly all steep, rugged, and mountainous, raising from an elevation of 3,000 feet in Willamette Valley to 8,250 upon Diamond Peak.

The soil is clay and very stony.

The undergrowth is dense along Willamette River, but light upon the ridges. It consists of vine maple, manzanita, alder, chinquapin, laurel, huckleberry, willow, yew, arrowwood, and cottonwood, with small pines and firs.

The average stand of timber is light, and consists largely of red fir, which occurs in heavy stands in the valley of the Willamette. About one-fourth of the timber is of good quality, but a large proportion of it is diseased. The other species, consisting mainly of Patton hemlock and lovely fir, are scrubby but of fair quality.

The timber in this township can all be logged by means of the Willamette, which is a good logging stream at most seasons of the year.

Classification of lands and forest conditions in T. 24 S., R. 5 E.

Forested area	acres..	20,460
Burned area	do....	1,820
Grass area	do....	700
Water surface	do....	60
Total stand	feet B. M..	220,250,000
Average stand per acre	do....	10,700
Litter		Light.

Statistics of forest trees in T. 24 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	130,250	131	29	29	5	50	209
Hemlock	42,000	65	16	12	3	15	180
Noble fir	6,000	80	20	16	2	5	180
Lovely fir	37,500	66	16	12	3	8	170
White pine	2,500	80	18	16	2	5	180
Lodgepole pine	2,000	.....	.....	.....	.....	.....	.....

Township 24 South, Range 5½ East.

This fractional township, consisting of thirty sections, lies upon the summit of the range, with Diamond Peak in its northwest corner. The surface of the township ranges from level to steep, mountainous, and broken country, and from an elevation of 5,700 to 8,250 feet, the height of Diamond Peak. Most of the township, however, ranges between the lower altitude and 6,500 feet.

The soil is clay, containing a good deal of pumice stone.

The undergrowth is very light, consisting of some lodgepole pines and hemlocks, laurel, manzanita, and huckleberry.

The timber consists entirely of scrubby hemlocks and small lodgepole pines, which are of no value except for firewood or fencing purposes.

Classification of lands and forest conditions in T. 24 S., R. 5½ E.

Forested area	acres..	17,010
Burned area	do....	640
Grass area	do....	630
Water surface	do....	920
Total stand	feet B. M..	66,500,000
Average stand per acre	do....	40,000
Litter		Light.

Statistics of forest trees in T. 24 S., R. 5½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	35,000	71	15	11	5	40	182
White pine	1,250	100	20	16	2	5	180
Lodgepole pine	30,250	.....	.....	.....	.....	.....	.....

Township 24 South, Range 6 East.

This township lies east of the summit of the range, and has in the main a broken surface, with numerous volcanic cones and buttes. Near the center of the

township is Crescent Lake, a body of water comprising about 6 square miles. The The surface is very steep on the north of Crescent Lake. Elsewhere the land is gently rolling.

The soil is clay, with a good deal of pumice stone scattered through it.

The undergrowth is light, consisting of small lodgepole pine, with alder, salal, willow, and huckleberry.

The timber consists of small lodgepole pine, which is of no value for lumber, having an average height of 50 feet and a diameter of 10 inches. Northwest of Crescent Lake there are some scattered trees of yellow pine, mostly of good quality. With the exception of these few trees, the timber in this township is of no value except for firewood or fencing.

The timber on this township can be logged into Crescent Lake very cheaply, or by a road to be built to the East Fork of Deschutes River.

Classification of lands and forest conditions in T. 24 S., R. 6 E.

Forested area	acres	18,345
Burned area	do	120
Grass area	do	1,015
Water surface	do	3,900
Total stand	feet B. M.	61,750,000
Average stand per acre	do	3,400
Litter		Light.

Statistics of forest trees in T. 24 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	6,750	64	14	9	4	8	151
Lovely fir	250	120	20	16	4	4	170
Yellow pine	11,250	112	27	19	4	11	231
White pine	1,000	.....	.....	.....	.....	.....	.....
Lodgepole pine	42,500	.....	.....	.....	.....	.....	.....

Township 25 South, Range 1 East.

This township lies upon the west side of the range, near its base, and consists of a broad mountain summit in the southwest corner of the township, whence the country slopes to the east and south to the valley of Steamboat Creek, which crosses the southwest corner. The elevation ranges from 2,000 to 5,600 feet. The surface is steeply rolling.

The soil is clay, with considerable stone interspersed through it.

The undergrowth is dense along the creeks, but on the uplands is light. It consists of vine maple, alder, huckleberry, soft maple, willow, arrowwood, hazel, yew, wild pea, dogwood, salal, laurel, and chinquapin, with ferns and young conifers.

The timber consists almost entirely of red fir, which is almost everywhere in heavy stands. About one-fifth of it is of good quality. There is a little cedar of excellent quality in the southeast part of the township. A little timber is found upon the mountain slopes, but it is all small and of little value.

The timber on the eastern part of this township can be logged to Steamboat Creek and that on the west to McKinley Creek, both of which streams are branches of the North Fork of Umpqua River. The latter is a good logging stream and these branches can easily be improved for logging purposes.

Classification of lands and forest conditions in T. 25 S., R. 1 E.

Forested area	acres..	23,040
Total stand	feet B. M..	625,500,000
Average stand per acre	do....	27,100
Litter		Light.

Statistics of forest trees in T. 25 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M Feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	530,000	184	31	46	5	37	132
Cedar	13,000	100	20	16	.....	10	180
Lovely fir	9,000	80	16	15	5	5	160
White pine	4,000	100	15	20	2	5	150

TOWNSHIP 25 SOUTH, RANGE 2 EAST.

This township lies upon the west side of the range, near its base. Along its western edge flows Steamboat Creek, while the township is mainly made up of heavy spurs sloping westward to its valley. The surface is steep, rugged, and broken.

The soil is of clay and very stony.

The undergrowth is dense along the creeks and light on the divides, consisting of vine maple, arrowwood, alder, huckleberry, salal, laurel, chinquapin, yew, hazel, wild pea, manzanita, and ferns, with young conifers.

The timber consists chiefly of red fir in heavy stands, one-fifth of which is of good quality. On the ridges are found hemlock and noble fir, one-fourth of which is good.

Steamboat Creek, in this township, is of no value as a logging stream. Its valley, however, will afford an easy route by means of which the timber on this township can be gotten out.

Classification of lands and forest conditions in T. 25 S., R. 2 E.

Forested area	acres..	22,420
Grass area	do....	620
Total stand	feet B. M..	552,000,000
Average stand per acre	do....	24,600
Litter		Light.

Statistics of forest trees in T. 25 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Noble fir	408,000	153	30	32	2	40	250
Red fir	124,000	94	15	17	2	5	142
Hemlock	20,000	106	17	20	1	4	150

Township 25 South, Range 3 East.

This township lies upon the west slope of the range, and consists in the main of a broad mountain spur separating the Willamette from the North Fork of Umpqua River, with valleys of streams to the east of the river. The surface is all steep and rugged.

The soil is clay, with much stone interspersed through it.

The undergrowth is light, consisting of vine maple, alder, laurel, chinquapin, yew, huckleberry, salal, manzanita, arrowwood, and ferns, with some young conifers.

The timber consists largely of red fir, one-fourth of which is of good quality; other species are commonly found along the creek bottoms. On the divides the timber consists mainly of hemlock, noble fir, and white pine, perhaps one-fourth of which is of good quality.

The timber in this township can be logged to the streams on the north and south, respectively, the Willamette and the North Fork of the Umpqua.

Classification of lands and forest conditions in T. 25 S., R. 3 E.

Forested area	acres..	20,490
Burned area	do....	1,340
Grass area	do....	1,210
Total stand	feet B. M..	375,500,000
Average stand per acre	do....	18,300
Litter		Light.

Statistics of forest trees in T. 25 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	136,000	152	29	42	26	30	213
Hemlock	145,250	78	16	14	16	8	165
Noble fir	79,250	139	22	40	14	5	168
Lovely fir	8,500	100	18	16	14	5	170
White pine	6,500	100	15	20	5	5	150

Township 25 South, Range 4 East.

This township lies upon the west slope of the range, and consists of high mountain spurs, separated by branches of the Willamette and North Umpqua rivers. The surface is steep, rugged, and broken.

The soil is of clay and very stony.

The undergrowth is light, consisting of vine maple, huckleberry, salal, yew, dogwood, manzanita, and laurel, with some small conifers.

The timber, which grows in fairly heavy stands, consists in the main of red fir, which is heavy in the valleys, and about 40 per cent of it is of good quality. It has also noble fir and white pine, one-fourth of which is of good quality, while the balance of the timber, consisting mainly of hemlock, is of little value.

The northern part of this township can be logged to the South Fork of Willamette River, while that on the south can go to the North Fork of Umpqua.

Classification of lands and forest conditions in T. 25 S., R. 4 E.

Forested area	acres	20,900
Burned area	do	1,200
Grass area	do	940
Total stand	feet B. M.	467,500,000
Average stand per acre	do	22,300
Litter		Light.

Statistics of forest trees in T. 25 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	283,000	169	26	47	14	31	194
Hemlock	121,000	77	16	16	5	8	155
Noble fir	52,000	150	24	40	5	5	180
Lovely fir	1,000	130	18	20	.....	5	150
White pine	10,500	100	15	24	.....	5	150

Township 25 South, Range 5 East.

This township lies on the west slope of the range, and is composed of heavy mountain spurs separating the head branches of the Willamette with the steep narrow gorges of these streams.

The soil is of clay, very stony on the ridges.

The undergrowth is light, consisting of small conifers, with laurel, chinquapin, manzanita, arrowwood, yew, huckleberry, vine maple, and salal.

The timber consists of red fir, hemlock, and noble fir, with a little white pine and lovely fir. The red fir is found mainly in the valleys and is of very good

quality. On the ridges are found hemlock, noble fir, and white pine, of which not more than one-fourth is of good quality.

The southern edge of this township can be logged into Umpqua River, while the northern, and much the larger, part will handle down branches of the Willamette.

Classification of lands and forest conditions in T. 25 S., R. 5 E.

Forested area	acres	21,750
Grass area	do	1,210
Water surface	do	80
Total stand	feet B. M.	444,000,000
Average stand per acre	do	20,400
Litter		Light.

Statistics of forest trees in T. 25 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	180,000	150	30	36	.....	20	225
Hemlock	152,000	94	18	16	.....	8	180
Noble fir	89,500	115	25	25	.....	5	188
Lovely fir	5,500	85	18	16	.....	5	165
White pine	16,000	126	27	30	.....	5	200
Lodgepole pine	1,000	.....	.....	.....	.....	.....	.....

Township 25 South, Range 6 East.

This township lies upon the summit of the range. The surface is mountainous or rolling, with an altitude ranging from 6,000 to 8,000 feet. It contains many small ponds and meadows in the southern part, and a small area has been burned.

The soil is of clay, with pumice stone.

The undergrowth is very light, consisting of young conifers, with vine maple, huckleberry, laurel, manzanita, alder, and salal.

The timber consists almost entirely of alpine or subalpine species, in surprisingly heavy stands, and of good quality.

The southern part of this township can be logged to the North Fork of Umpqua River, the northwestern part by a small stream to Willamette River, while the northeastern corner can be taken out to Deschutes River. None of these streams are drivable in their present condition in this township.

Classification of lands and forest conditions in T. 25 S., R. 6 E.

Forested area	acres	21,180
Burned area	do	1,500
Grass area	do	240
Water surface	do	120
Total stand	feet B. M.	403,000,000
Average stand per acre	do	19,000
Litter		Light.

Statistics of forest trees in T. 25 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	21,000	180	36	40	20	40	225
Hemlock	205,250	96	18	16	13	15	190
Noble fir	140,000	125	20	20	13	10	200
Lovely fir	11,250	80	16	16	.....	5	160
Yellow pine	250	130	30	32	.....	10	250
White pine	18,000	125	20	24	5	5	200
Lodgepole pine	7,250	.....	.....	.....	.....	.....	.....

Township 25 South, Range 6½ East.

This fractional township, consisting of thirty sections, lies mainly east of the summit of the range across its southwest corner. The southwestern part is somewhat broken and steep, while the remainder is level or gently rolling. The altitude ranges from 5,000 to 6,000 feet, and exceeds 7,000 feet in Cowhorn Peak.

The soil is clay, containing a large amount of pumice stone.

The undergrowth is very light, consisting of laurel and manzanita, with small pines and hemlocks.

The timber is nearly all of subalpine species, in greater part consisting of hemlock with some noble fir and a sprinkling of numerous other species. None of it is of much value, being small and in great part scrubby. The best timber consists of a small amount of yellow pine, which is of excellent quality.

This timber can be taken out, if desired, to the East Fork of Deschutes River.

Classification of lands and forest conditions in T. 25 S., R. 6½ E.

Forested area	acres..	16,060
Burned area	do....	1,700
Grass area	do....	1,440
Total stand	feet B. M..	194,250,000
Average stand per acre	do....	12,000
Litter		Light.

Statistics of forest trees in T. 25 S., R. 6½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	109,750	93	17	16	3	11	174
Spruce	4,000	150	18	16	2	5	184
Noble fir	55,750	123	19	22	2	6	187
Yellow pine	7,500	128	30	28	5	10	250
White pine	10,750	109	22	26	3	6	170
Lodgepole pine	6,500	.....	.....	.....	.....	.....	.....

Township 26 South, Range 1 East.

This township lies upon the west slope of the range, near its foot, and includes a section of the valley of the North Fork of Umpqua River, with hill spurs on either side. The surface is steep and broken, with the exception of a narrow tract of level lands along the river.

The soil is red shot clay, stony on the ridges and gravelly along the river.

The undergrowth is dense, consisting of young conifers with vine maple, elderberry, ferns, wild pease, willow, cottonwood, laurel, huckleberry, salal, manzanita, yew, arrowwood, and hazel. Several large tracts in this township were burned a great many years ago. The remaining timber, consisting almost entirely of red fir, is in heavy stand, with about 25 per cent of it of good quality.

The timber on this township can be logged to the North Fork of Umpqua River, which is a good logging stream at nearly all seasons of the year. As an alternative a railroad can easily be built up the valley of this stream. From the west, about 50 per cent of the timber of this township can be taken out very cheaply.

Classification of lands and forest conditions in T. 26 S., R. 1 E.

Forested area	acres	15,800
Burned area	do	7,240
Total stand	feet B. M.	378,500,000
Average stand per acre	do	23,000
Litter		Light.

Statistics of forest trees in T. 26 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	359,000	152	28	34	66	40	201
Hemlock	19,000	70	12	11	.....	5	125
Noble fir	500	80	16	20	.....	5	160

Township 26 South, Range 2 East.

This township lies well down upon the west slope of the range, and includes a section of the valley of the North Fork of Umpqua River, with the spurs upon either side. The surface is steeply rolling, with the exception of the narrow level valley of the river.

The soil is red shot clay, very gravelly along the river.

The undergrowth is dense, consisting of young conifers, with huckleberry, salal, vine maple, willow, cottonwood, hazel, laurel, yew, chinquapin, dogwood, arrowwood, manzanita, and ferns.

The timber consists for the greater part of red fir, not less than four-fifths of it being of good quality. There is a little white pine also of good quality, and some hemlock which, however, is small and poor.

This township can be logged to the North Fork of Umpqua River, and half the timber in it can be taken out very cheaply. The river is a good logging stream through most seasons of the year.

Classification of lands and forest conditions in T. 26 S., R. 2 E.

Forested area	acres..	18,300
Burned area	do....	4,380
Grass area	do....	360
Total stand	feet B. M..	298,750,000
Average stand per acre	do....	16,200
Litter		Light.

Statistics of forest trees in T. 26 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	233,000	175	30	40	46	40	225
Hemlock	52,000	78	14	14	24	8	153
Noble fir	2,750	100	18	20	.....	5	180
White pine	11,000	125	18	24	3	5	180

Township 26 South, Range 3 East.

This township lies upon the west slope of the range, and includes a section of the valley of the North Fork of Umpqua River, with the spurs upon either side. The surface is steeply rolling and broken.

The soil is of clay, and is very stony.

The undergrowth is dense, consisting of young conifers, with vine maple, huckleberry, dogwood, hazel, alder, willow, manzanita, chinquapin, laurel, yew, arrowwood, wild pea, and ferns.

The timber is chiefly red fir, 30 per cent of which is of excellent quality. There is also a large amount of hemlock, all small and about one-fifth of it of value. The white pine, of which there is a small quantity, is all of good quality.

The timber in this township can be logged to the North Fork of Umpqua River, which is a good logging stream at most seasons of the year. There is also a good opportunity for building a railroad up its valley into this township.

Classification of lands and forest conditions in T. 26 S., R. 3 E.

Forested area	acres..	22,800
Burned area	do....	240
Total stand	feet B. M..	452,250,000
Average stand per acre	do....	11,000
Litter		Light.

Statistics of forest trees in T. 26 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	340,000	175	32	40	15	40	225
Hemlock	106,000	80	15	16	7	5	150
Noble fir	750	100	20	24	.....	10	180
White pine	5,500	120	20	24	2	5	180

Township 26 South, Range 4 East.

This township lies upon the west slope of the range, and includes a section of the valley of Umpqua River, with the mountain spurs on either side. The surface is steep and broken.

The soil is clay and very stony.

The undergrowth is dense along the river, but light on the uplands, and consists of young fir trees, with vine maple, alder, willow, cottonwood, arrowwood, hazel, yew, dogwood, chinquapin, manzanita, and salal.

The timber consists chiefly of red fir in fairly heavy stand, and about 25 per cent of it of good quality, the balance being rough and scrubby. There is some hemlock, which is small and poor, and a little noble fir and white pine of good quality.

This township can all be logged to the Umpqua River, which is a good logging stream during most seasons of the year.

Classification of lands and forest conditions in T. 26 S., R. 4 E.

Forested area	acres..	20,640
Burned area	do....	2,400
Total stand	feet B. M..	363,500,000
Average stand per acre	do....	17,500
Litter		Light.

Statistics of forest trees in T. 26 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	234,750	160	30	40	21	30	220
Hemlock	109,000	90	16	16	10	8	165
Noble fir	9,500	100	20	24	.....	5	180
White pine	10,250	125	18	24	.....	5	180

Township 26 South, Range 5 East.

This township lies west of the crest of the range and includes the valley of the North Fork of Umpqua River, with the mountain spurs upon either side. The surface is steeply rolling and broken.

The soil is of clay and very stony.

The undergrowth is dense along the river and light on the uplands. It consists of young firs and pines, with vine maple, alder, huckleberry, yew, dogwood, hazel, arrowwood, chinquapin, manzanita, and salal.

The timber consists largely of red fir in somewhat scattering stands, 25 per cent of it being of good quality. There are considerable noble fir and white pine, 40 per cent of which is of good quality, while the hemlock, which is present in large amount, is of poor quality.

This entire township can be logged to the North Fork of Umpqua River, which is a very good logging stream during most seasons of the year.

Classification of lands and forest conditions in T. 26 S., R. 5 E.

Forested area	acres	22,320
Burned area	do	160
Grass area	do	560
Total stand	feet B. M.	318,750,000
Average stand per acre	do	14,200
Litter		Light.

Statistics of forest trees in T. 26 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	147,000	150	30	40	10	25	220
Hemlock	141,500	90	17	14	5	12	170
Noble fir	19,000	100	18	24	.....	10	180
Yellow pine	250	150	30	30	.....	10	225
White pine	8,500	125	16	24	.....	5	160
Lodgepole pine	2,500	.....	.....	.....	.....	.....	.....

Township 26 South, Range 6 East.

This township lies just west of the summit of the range. Its surface is mountainous or rolling at an altitude ranging from 5,000 to 6,000 feet.

The soil is clay with much pumice stone.

The undergrowth is light, consisting of small firs, hemlocks, and pines, with manzanita, vine maple, yew, and huckleberry.

The timber consists almost entirely of hemlock, with a little noble fir, white and lodgepole pine, and a trifling amount of yellow pine. About one-fifth of the timber is of good quality, the remainder being rough and scrubby.

This township can be logged to the North Fork of Umpqua River, which, however, is here of little value as a logging stream, as it is very rapid and flows through most of this part of its course in a deep canyon.

Classification of lands and forest conditions in T. 26 S., R. 6 E.

Forested area	acres	18,160
Burned area	do	2,810
Grass area	do	2,070
Total stand	feet B. M.	211,000,000
Average stand per acre	do	11,600
Litter		Light.

Statistics of forest trees in T. 26 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	150,500	75	15	12	17	20	160
Noble fir	28,000	100	18	20	5	10	180
Yellow pine	4,500	150	30	30	10	10	225
White pine	10,250	125	18	24	5	5	180
Lodgepole pine	17,750						

Township 26 South, Range 6½ East.

This fractional township of thirty sections includes the summit of the range and its immediate slopes to the east and west. The country is rolling and somewhat broken.

The soil is of clay, with much pumice stone.

The underbrush is very light, consisting of young conifers, with vine maple, alder, huckleberry, and manzanita.

The altitude being very great, ranging from 6,000 to 7,000 feet, the timber consists mainly of subalpine species, nine-tenths of it consisting of hemlock, with a little white pine and scattering lodgepole pine, while a little red fir is found at the lowest elevations on the west. The hemlock is of poor quality.

East of the divide the timber on this township can be handled to the East Fork of Deschutes River, while that on the west can be logged to the North Fork of Umpqua River.

Classification of lands and forest conditions in T. 26 S., R. 6½ E.

Forested area	acres	18,600
Burned area	do	360
Grass area	do	240
Total stand	feet B. M.	280,750,000
Average stand per acre	do	15,000
Litter		Light.

Statistics of forest trees in T. 26 S., R. 6½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	4,500	100	17	12	10	30	135
Hemlock	240,000	98	18	12	5	20	180
White pine	25,250	100	18	20	.....	10	180
Lodgepole pine	11,000	.....	.....	.....	.....	.....	.....

Township 27 South, Range 1 East.

This township lies on the west slope of the Cascade Range, near its foot. The surface is steep and very broken.

The soil is red shot clay, stony on the ridges.

The undergrowth is dense, consisting of vine maple, arrowwood, dogwood, hazel, huckleberry, salal, chinquapin, laurel, willow, manzanita, and ferns, with young conifers.

The timber consists mainly of red fir, in very heavy stands, and half of it is of excellent quality. It has also a large amount of hemlock, some noble fir, and a little white pine. The latter, though small, is of good quality.

The western part of this township can be logged down Little River, a branch of the Umpqua, while the eastern part can be logged directly into the North Fork of Umpqua River.

Classification of lands and forest conditions in T. 27 S., R. 1 E.

Forested area	acres	21,530
Burned area	do	1,400
Grass area	do	1,010
Total stand	feet B.M.	677,750,000
Average stand per acre	do	31,200
Litter		Light.

Statistics of forest trees in T. 27 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	465,000	162	30	45	28	40	217
Cedar	3,750	150	28	24	.....	20	188
Incense cedar	6,000	150	36	24	5	25	225
Hemlock	125,000	95	15	13	10	5	154
Noble fir	60,500	133	20	22	7	10	194
White pine	17,250	123	19	28	7	5	179
Lodgepole pine	250	.....	.....	.....	.....	.....	.....

Township 27 South, Range 2 East.

This township lies on the west slope of the Cascade Range, not far from its base. The surface is rugged and broken.

The soil is clay, commonly very stony.

The undergrowth is dense, consisting of vine maple, arrowwood, hazel, willow, dogwood, salal, huckleberry, yew, chinquapin, fir, wild peas and laurel, with young conifers.

The timber, which is fairly heavy, consists in the main of red fir, only one-fourth of which, however, is of good quality. There is also a considerable quantity of hemlock, and a little white pine, which, though small, is of good quality.

The township can be logged to the North Fork of Umpqua River, which is a good logging stream, having sufficient water for driving purposes at nearly all times of the year.

Classification of lands and forest conditions in T. 27 S., R. 2 E.

Forested area	acres	19,580
Burned area	do	2,460
Grass area	do	1,000
Total stand	feet B. M.	339,000,000
Average stand per acre	do	17,300
Litter		Light.

Statistics of forest trees in T. 27 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	175,000	150	36	40	16	25	250
Cedar	250	50	12	15	.....	10	140
Hemlock	131,500	100	17	15	10	8	165
Noble fir	20,000	125	18	24	9	5	180
Lovely fir	1,000	100	15	16	5	5	150
White pine	11,500	100	15	24	5	5	150

Township 27 South, Range 3 East.

This township lies upon the west slope of the Cascade Range, and contains a section of the valley of the North Fork of Umpqua River, with the spurs leading down to it. The surface is steep, rugged, and mountainous.

The soil is of clay and very stony on the ridges.

The undergrowth is dense along creek bottoms, but light on the ridges, consisting of huckleberry, alder, salal, vine maple, hemlock, willow, arrowwood, dogwood, manzanita, wild peas, ferns, and laurel, with young conifers.

The timber consists mainly of red fir in heavy stands, especially in the valleys, about 40 per cent of it being of good quality. There is considerable hemlock and a little white pine. The latter is small, but of good quality, while other species are of little value.

The township can be logged to the North Fork of Umpqua River, with the exception of a small tract in the northwest portion of the township, which will have to go to another tributary of the same stream.

Classification of lands and forest conditions in T. 27 S., R. 3 E.

Forested area	acres	21,900
Burned area	do	880
Grass area	do	260
Total stand	feet B. M.	457,250,000
Average stand per acre	do	20,800
Litter		Heavy.

Statistics of forest trees in T. 27 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	337,000	150	36	40	33	25	250
Hemlock	104,500	87	14	14	15	13	150
Noble fir	9,500	100	16	20	.....	5	160
Lovely fir	500	80	16	15	.....	5	160
White pine	5,750	120	20	24	.....	5	180

Township 27 South, Range 4 East.

This township lies on the west slope of the range, near the headwaters of the North Fork of Umpqua River, and is made up of high mountain spurs, reaching an altitude exceeding 6,000 feet, separating the narrow stream valleys. The country is broken and rugged.

The soil is of clay, very stony on the ridges.

The undergrowth is dense along the creek bottoms and light on the uplands, and consists of vine maple, alder, arrowwood, hazel, laurel, manzanita, yew, dogwood, ferns, pea vine, huckleberry, and salal, with young conifers.

The timber consists mainly of red fir, the heaviest and best of which is found in the creek bottoms. On the ridges and divides the timber consists of other species, such as hemlock, noble fir, and white fir. Of the red fir, about 30 per cent is of good quality. Of the other species, not more than 20 per cent is of value. The timber of this township can be logged directly into the branches of the Umpqua and thence to the main stream, which is a good logging stream.

Classification of lands and forest conditions in T. 27 S., R. 4 E.

Forested area	acres	21,960
Grass area	do	1,080
Total stand	feet B. M.	418,000,000
Average stand per acre	do	19,000
Litter		Light.

Statistics of forest trees in T. 27 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	261,000	171	28	40	.....	20	220
Hemlock	127,000	87	15	14	.....	8	160
Noble fir	19,000	125	18	24	.....	5	170
White pine	11,000	125	18	24	.....	5	170

Township 27 South, Range 5 East.

This township lies high up in the Cascade Range, and consists mainly of an elevated, rolling mountain spur, at a mean elevation of 6,000 feet above the sea. It is drained by the North Fork of the Umpqua River on the east and by Fish Creek and streams tributary to the North Fork of the Umpqua on the west.

The soil is of clay, and very stony.

The undergrowth is dense along streams, but light upon the uplands. It consists of hemlock, salal, vine maple, arrowwood, manzanita, alder, laurel, and young conifers.

The timber consists chiefly of the alpine species, hemlock and noble fir, with a little red fir at the lower altitudes, most of the timber being in the western part of the township. Of the red fir, about 40 per cent is of good quality.

This township can be logged to the North Fork of the Umpqua, which in its present condition, however, is here of little value as a logging stream, since it is rapid and flows in a deep canyon most of the way across the township.

Classification of lands and forest conditions in T. 27 S., R. 5 E.

Forest area	acres	22,160
Grass area	do	880
Total stand	feet B. M.	343,000,000
Average stand per acre	do	15,400
Litter		Light

Statistics of forest trees in T. 27 S., R. 5 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	105,000	173	29	37	5	40	221
Hemlock	160,500	88	15	16	5	15	164
Noble fir	60,500	118	16	20	.....	10	158
White pine	500	100	18	20	.....	5	180
Lodgepole pine	16,500	.....	.....	.....	.....	.....	.....

Township 27 South, Range 6 East.

This township lies high up in the Cascade Range, upon the summit and west slope. It lies mainly at a great altitude, ranging from 5,000 to 8,000 feet above sea level. Considerable parts of its surface are high above timber line and consist of open, grassy meadows. A part of Diamond Lake is in the southwest corner, and in the northwest corner is a small burned area. The surface is extremely rough and broken. The soil consists of clay and pumice.

The undergrowth is light, composed of huckleberry, salal, manzanita, laurel, chinquapin, vine maple, and alder, with young pines and hemlocks.

The timber consists chiefly of hemlock, noble fir, and white pine, a small proportion of which is of good quality, the balance being rough and knotty. Near the western edge of the township is a little red fir, but of poor quality. There are a few scattered yellow pines in the same part of the township.

Should this timber ever be wanted, it could be logged to the North Fork of Umpqua River, which, however, in its present condition in this township is of no value as a logging stream.

Classification of lands and forest conditions in T. 27 S., R. 6 E.

Forested area	acres	18,490
Burned area	do	620
Grass area	do	3,070
Water surface	do	860
Total stand	feet B. M.	387,750,000
Average stand per acre	do	20,900
Litter		Light.

Statistics of forest trees in T. 27 S., R. 6 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	23,750	156	36	34	11	50	235
Hemlock	240,000	80	18	16	6	20	180
Spruce	1,500	150	20	40	5	10	180
Noble fir	96,500	86	19	19	10	5	198
Lovely fir	3,500	100	12	20	5	5	160
Yellow pine	5,500	125	30	24	10	10	225
White pine	8,750	150	20	40	5	5	200
Lodgepole pine	8,250						

Township 27 South, Range 6½ East.

This is a fractional township, comprising the five eastern tiers of sections. It lies on the summit and eastern slope of the range, and its surface is steep, rugged, and broken, with altitudes ranging from 6,000 to 8,000 feet. It is drained almost entirely to the eastward. It contains considerable areas of open country lying above the timber line, a burned area comprising about two-thirds of a section, and the area of Fish Lake in the northeastern part of the township.

The soil is mostly clay, with much pumice stone.

The undergrowth is light, consisting of willow, manzanita, laurel, with young hemlock and lodgepole pine.

The timber consists almost entirely of alpine species, principally hemlock and lodgepole pine. There is a little yellow and sugar pine at the lower altitudes.

The timber upon this township, should it ever be wanted, can be logged eastward to the East Fork of Deschutes River.

Classification of lands and forest conditions in T. 27 S., R. 6½ E.

Forested area	acres	16,745
Burned area	do	460
Grass area	do	1,560
Water surface	do	705
Total stand	feet B. M.	194,000,000
Average stand per acre	do	11,700
Litter		Light.

Statistics of forest trees in T. 27 S., R. 6½ E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	120,750	66	16	10	6	25	173
Spruce	2,000	125	20	20	.....	5	180
Noble fir	12,250	88	17	18	5	10	172
Sugar pine	1,500	175	36	30	.....	10	250
Yellow pine	1,000	130	36	21	.....	10	250
White pine	8,500	125	15	24	5	5	150
Lodgepole pine	48,250	.....	.....	.....	.....	.....	.....

Township 28 South, Range 1 East.

The surface of this township consists of the broken spurs of the west slope of the range, and is steep, rugged, and broken.

The soil is of clay and very stony on the ridges.

The undergrowth is light upon the uplands, but dense along the creeks, consisting of vine maple, huckleberry, salal, yew, arrowwood, alder, wild peas, laurel, chinquapin, manzanita, and dogwood, with some young conifers.

The township is well timbered, almost entirely with red fir, the stands of which are very even, and at least 40 per cent of it is of excellent quality. There is a scattered growth of white pine in this township, all of good quality.

The timber in this township can be logged southward to the North Fork of the South Fork of Umpqua River, which, however, without improvement is of no value as a logging stream.

Classification of lands and forest conditions in T. 28 S., R. 1 E.

Forested area	acres..	23,040
Total stand	feet B. M..	407,500,000
Average stand per acre	do....	17,700
Litter		Light.

Statistics of forest trees in T. 28 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	356,000	148	29	34	.....	25	215
Hemlock	36,000	100	16	20	.....	5	160
Noble fir	1,500	125	20	24	.....	5	180
Lovely fir	6,000	125	16	20	.....	5	160
White pine	8,000	120	20	24	.....	5	180

Township 28 South, Range 2 East.

This township lies upon the west slope of the range, and includes a section of the valley of the North Fork of the South Fork of Umpqua River, with the mountain spurs leading down to it. The surface is all steep and hilly. The soil is of stony clay.

The undergrowth is dense, consisting of vine maple, alder, willow, salal, huckleberry, wild peas, chinquapin, manzanita, dogwood, hazel, yew, arrowwood, and ferns, with young conifers.

The timber, which is very heavy upon this township, consists mainly of red fir, half of which is of excellent quality. Besides, there is considerable hemlock and noble fir, with a little white pine, all of good quality.

This township can be logged to the North Fork of the South Fork of Umpqua River, which flows through it. This stream is of no value, however, as a logging stream in its present condition, as it is very rapid and has insufficient water for driving purposes.

Classification of lands and forest conditions in T. 28 S., R. 2 E.

Forested area	acres..	23,040
Total stand	feet B. M..	906,500,000
Average stand per acre	do....	39,300
Litter		Light.

Statistics of forest trees in T. 28 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	644,000	158	32	34	.....	20	238
Incense cedar	8,000	120	19	16	.....	20	193
Hemlock	130,500	104	19	19	.....	10	161
Noble fir	111,000	150	12	30	.....	5	210
Lovely fir	2,250	125	21	20	.....	5	140
White pine	11,000	140	22	28	.....	5	210

Township 28 South, Range 3 East.

This township lies on the west slope of the Cascade Range. Its surface is extremely rugged, broken, and mountainous.

The soil is a very stony clay.

The undergrowth is dense along the creeks, but light on the uplands, consisting of salal, ferns, laurel, chinquapin, manzanita, yew, dogwood, hazel, alder, huckleberry, vine maple, with young conifers.

The timber is very heavy, taking the township as a whole, and consists in large

part of red fir, 40 per cent of it being of good quality. There is also an even larger amount of noble fir of good quality, with smaller amounts of hemlock and lovely fir.

This township can all be logged to the North Fork of the South Fork of Umpqua River, with the exception of a small tract in the northeastern part of the township, which will go to the North Fork of Umpqua River.

Classification of lands and forest conditions in T. 28 S., R. 3 E.

Forested area	acres..	22,790
Burned area	do....	250
Grass area	do....	1,480
Total stand	feet B. M..	708,250,000
Average stand per acre	do....	29,200
Litter		Light.

Statistics of forest trees in T. 28 S., R. 3 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	247,500	147	23	28	5	30	178
Cedar	750	100	20	16	.....	20	145
Hemlock	113,500	100	17	16	13	8	180
Noble fir	319,500	148	20	30	12	10	200
Lovely fir	26,000	100	16	18	10	5	160
Yellow pine	500	140	30	24	.....	10	240
White pine	500	125	20	24	.....	5	200

Township 28 South, Range 4 East.

This township lies upon the west slope of the Cascade Range, and contains an area of extremely broken, mountainous, and rugged country.

The soil is red shot clay and on the ridges is very stony.

The undergrowth is dense, consisting of salal, huckleberry, vine maple, alder, willow, arrowwood, dogwood, chinquapin, laurel, manzanita, and ferns, with young conifers.

The timber is very heavy, and consists in great part of red fir, which is found mainly along the creeks, and of noble fir, about 50 per cent of which is of good quality. Other species are represented, but in small amounts, and none of them is of much value for lumber.

The timber in this township can all be taken out by way of branches of the North Fork of Umpqua River, with the exception of the small tract of timber near the south line of the township, which can be logged to Rogue River.

Classification of lands and forest conditions in T. 28 S., R. 4 E.

Forested area	acres..	20,870
Burned area	do....	290
Grass area	do....	1,880
Total stand	feet B. M..	519,400,000
Average stand per acre	do....	24,800
Litter		Light.

Statistics of forest trees in T. 28 S., R. 4 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	168,500	169	29	31	10	25	212
Incense cedar	2,000	150	30	20	.....	20	.....
Hemlock	108,250	74	17	15	7	8	166
Noble fir	202,750	129	19	25	8	10	196
Lovely fir	21,250	120	12	22	5	5	125
White fir	3,000	100	15	16	.....	5	150
White pine	12,250	120	15	24	.....	5	150
Lodgepole pine	1,500	.....	.....	.....	.....	.....	.....

Township 29 South, Range 1 East.

This township lies on the west side of the range, near its base. It is traversed from northeast to southwest by the North Fork of the South Fork of Umpqua River, in a narrow valley. This river with its tributaries drains the area of the township. The surface consists of heavy hill spurs separated by the valleys of these streams. The altitude ranges from 2,000 to 4,000 feet.

The soil is clay, which is very stony upon the ridges.

The undergrowth is light on the ridges but dense in the creek valleys.

The timber consists almost entirely of red fir in heavy stands, with a small amount of Patton hemlock, which is found on the ridges.

The timber on this township can be logged down the North Fork of the South Fork of Umpqua River, which, however, in its present condition, is of no value as a logging stream.

Classification of lands and forest conditions in T. 29 S., R. 1 E.

Forested area	acres..	23,040
Total stand	feet B. M..	530,000,000
Average stand per acre	do....	23,000

Statistics of forest trees in T. 29 S., R. 1 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	440,000						
Hemlock	90,000						

Township 29 South, Range 2 East.

This township lies on the west slope of the range, near its foot. It consists of broad spurs sloping down to the South Fork of Umpqua River. The country is steep and broken.

The soil consists of a very stony clay.

The undergrowth is light, consisting of vine maple, laurel, alder, chinquapin, manzanita, yew, arrowwood, and ferns, interspersed with young conifers.

The timber consists of fir and hemlock, the former of a fairly heavy stand and in good condition.

The timber can be taken out by means of a railroad up the valley of the South Fork of Umpqua River. The river in its present condition is of no value as a logging stream.

Classification of lands and forest conditions in T. 29 S., R. 2 E.

Forested area	acres..	23,040
Total stand	feet B. M..	435,000,000
Average stand per acre	do....	18,800

Statistics of forest trees in T. 29 S., R. 2 E.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	M feet B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	360,000						
Hemlock	75,000						

SOUTHERN PART OF CASCADE RANGE FOREST RESERVE.[a]

By JOHN B. LEIBERG.

DESCRIPTIONS OF TOWNSHIPS.

TOWNSHIP 28 SOUTH, RANGE 5 EAST.

This township is situated on the summit of the main range of the Cascades. Its southern and central portions consist of an almost level pumice plain. The northern sections comprise high ridges, which here and there rise into prominent peaks, all of which are extinct volcanic cones. These ridges and peaks constitute the junction point of the main range of the Cascades and the Umpqua-Rogue River divide.

The southern areas have no visible run-off. The northern discharge limited quantities of water partly by way of tributaries to the South Umpqua, partly into Diamond Lake, whence it finds its way to the North Umpqua.

There are no agricultural lands, and no mineral-bearing areas are known in the township.

The grazing lands consist of fire glades along the west shore of Diamond Lake, whose southern end barely touches the township. The glades constitute in part the great sheep ranges of the high Cascades, which extend northward from this and the next township on the east.

The forest is of the Patton-hemlock type. The southern and central portions are covered with stands of lodgepole pine, all reforestations after fires and representative of all ages of burns from one hundred and fifty years ago up to the present time. There is no portion of these or of the heavier stands of Patton hemlock and noble fir in the northern sections of the township that have not been visited by fire within the past forty-five years. Reforestations consist wholly of lodgepole pine as the first growth. In some places on warm southern declivities brush growth comes in after fires. In other localities a grass and sedge sward covers the ground. It is clearly evident that many of the fires have been set for the purpose of promoting these grass growths and enlarging the possible sheep range. It is also noticeable that wherever fires have been kept down for four or five years

[a] Republished from Mr. J. B. Leiberg's paper in the Twenty-first Annual Report.

there is a gradual return to forest and a disappearance of the grass. As before remarked, it is essential to the maintenance of the stability of the water heads in the pumice-covered regions of the high Cascades that the pumice cover be disturbed as little as possible. To this end reforestations should be encouraged in every possible manner, even at the expense of destroying the grass and sedge swards by allowing the forest to regain possession.

The mill timber is of poor quality and is confined to the northern sections of the township, where it is inaccessible for logging operations.

Classification of lands in T. 28 S., R. 5 E.

	Acres.
Forested area	23,040
Badly burned area	18,000
Logged area	None.

Total stand of timber in T. 28 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine	16.7	5,000,000	5,000,000
Noble fir	66.7	20,000,000	25,000,000
Patton hemlock	16.6	5,000,000	10,000,000
Total		30,000,000	40,000,000

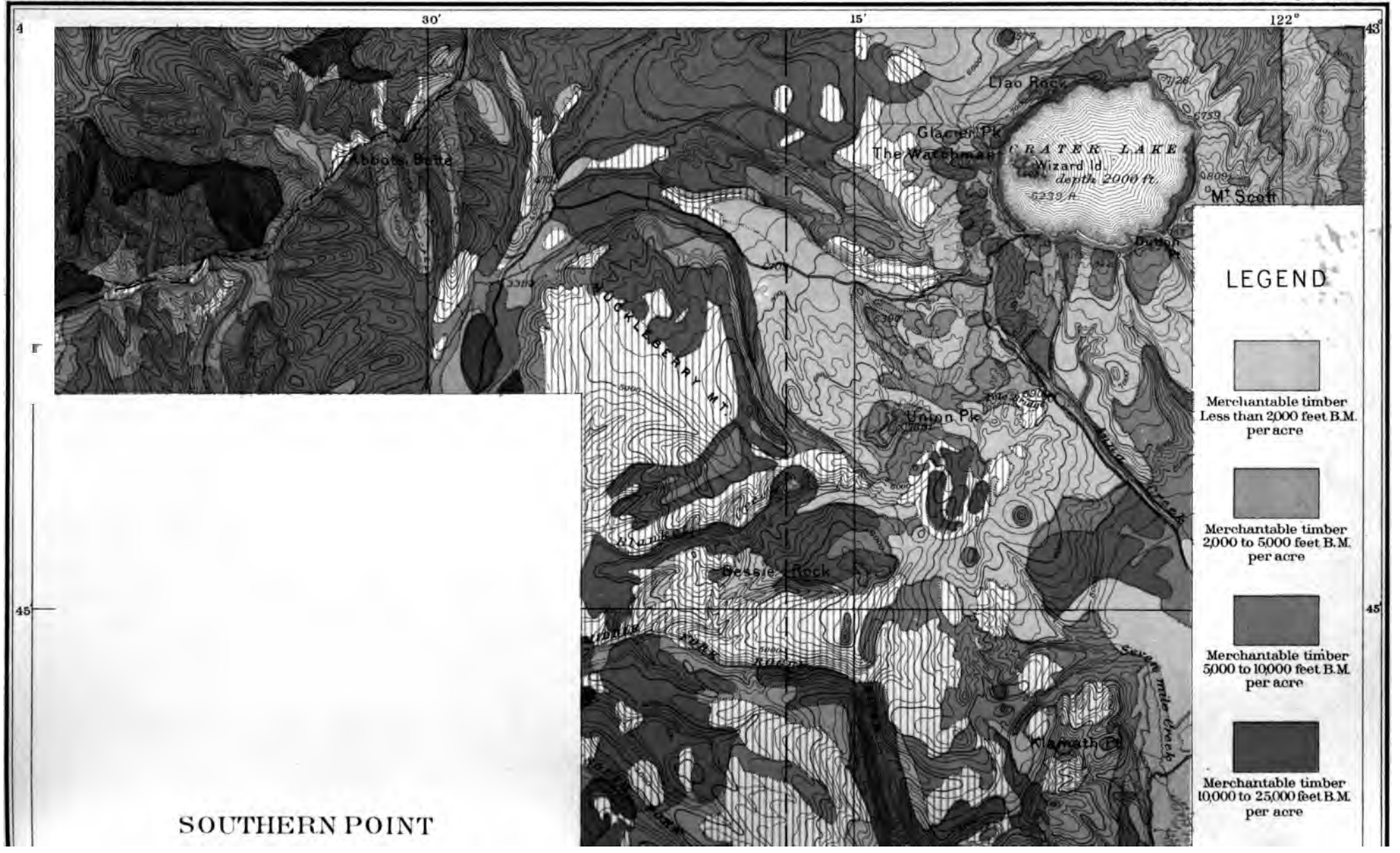
Composition of forests in T. 28 S., R. 5 E., including all species with diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	80
Noble fir	10
Patton hemlock	9.2
White pine	.8

Township 28 South, Range 6 East.

The areas comprised within the lines of this township are situated on the summit of the main range of the Cascades. The southern and central areas consist of a nearly level pumice-covered region. The northern sections are rocky with numerous ridges stretching westward from Mount Thielsen, an extinct volcanic center occupying the northeast corner of the township. About two sections in the northeast corner are comprised in Diamond Lake, and an additional two sections in a series of swamps at its southern extremity. There is practically no visible drainage originating in the township. A large stream heading in T. 28 S., R. 4 E., flows through it and empties into Diamond Lake.

There are no agricultural and no mineral lands in the township. There is a large amount of grazing land, consisting in part of fire glades and in part of 1,200 acres of



SOUTHERN POINT

OREGON

Showing land classification

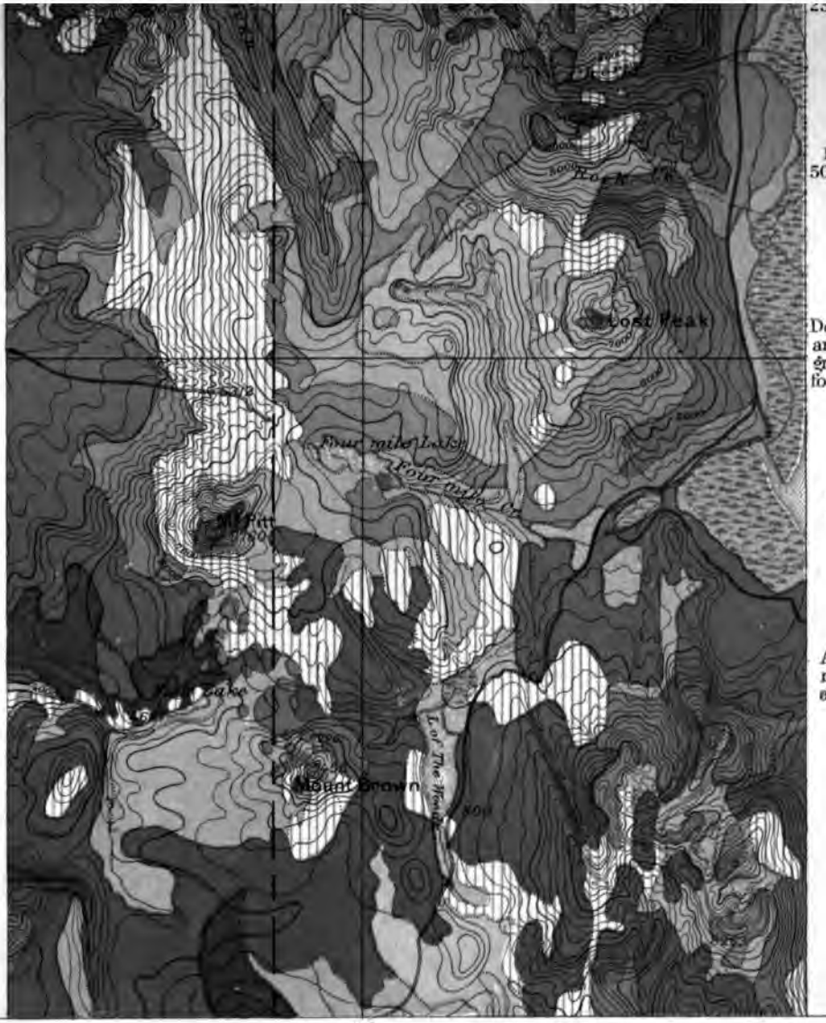
BY J. B. LEIBERG.

Scale

2 0 2 4 6 8 10 miles

Contour interval 200 feet

Datum is mean sea level



Merchantable timber 50,000 and over feet B.M per acre

Deforested areas and areas covered with brush-growth as the result of forest fires

Areas of bare rocks or pumice fields

Areas non-forested, as marshes, meadows, and agricultural lands

30'

30'

15'

122°

JULIUS BIEN & CO. LITH. N.Y.

marsh and overflowed land at the south end of Diamond Lake. The dry tracts are all used for sheep range.

The forest consists of stands of Patton-hemlock type. Ninety per cent of it is composed of lodgepole-pine reforestations. Some of these stands date back to the Indian occupancy, others are the result of fires set by the white man. All of the forest is fire marked. Reforestations after fires are invariably composed of lodgepole pine. Repeated conflagrations and total destruction of the forest bring grass and sedge growths. Fires in the township have been fewer during the past four or five years than formerly, and most of the grassy tracts are slowly reforesting.

The mill timber is of poor quality and is confined to the spurs of Mount Thielsen. It exists in small scattered bodies and is inaccessible for logging operations.

Classification of lands in T. 28 S., R. 6 E.

	Acres.
Forested area	18,000
Badly burned area	15,000
Nonforested area (lake, swamps, bare rocks, etc.)	5,040
Logged area	None.

Total stand of timber in T. 28 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Noble fir	60	3,000,000	3,000,000
Patton hemlock	40	2,000,000	2,000,000
Total		5,000,000	5,000,000

Composition of forest in T. 28 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	95
Noble fir	3
Patton hemlock	2

Township 29 South, Range 3 East.

The northern and central portions of this township consist of high ridges belonging to the northern slopes of the Umpqua-Rogue River divide. The southern areas comprise tracts with comparatively low relief, constituting parts of the upper drainage basin of the North Fork of Rogue River. A deposit of pumice covers the southern sections, while the northern have only a light covering of this material, or, in many places, are entirely free of it.

The volume of run-off from the township is very large. Most of it is discharged into the South Umpqua, a smaller portion going into Rogue River through

the North Fork of this stream. The Umpqua-Rogue River divide that here supplies most of the run-off is not of the same volcanic formation as the Cascades. It evidently is much less fissured, and therefore sheds a great deal more of the precipitation as visible drainage.

The township contains no agricultural land. Mineral-bearing ground has been discovered in various localities along the crest and slopes of the Umpqua-Rogue River divide. Along the summits and flanks of the higher ridges is a considerable quantity of grazing land which is utilized for sheep range. The grazing areas consist wholly of fire glades or of rocky slopes which have not reforested after fires.

The forest consists of stands of red-fir and Patton-hemlock types. It is fire marked throughout.

Reforestations are composed chiefly of lodgepole pine, in the stands of which the grass and sedge swards that came in after the fires persist for a long time. In some localities, especially where fires have been particularly destructive, brush growths, composed of the vellum-leaved ceanothus, occupy the ground.

The mill timber is of poor quality and is generally defective, owing to the numerous fires that have swept through the township during the past forty or forty-five years. Most of it is inaccessible for logging operations; but a small quantity in the southern sections can be reached by way of the valley of the North Fork of Rogue River.

Classification of lands in T. 29 S., R. 3 E.

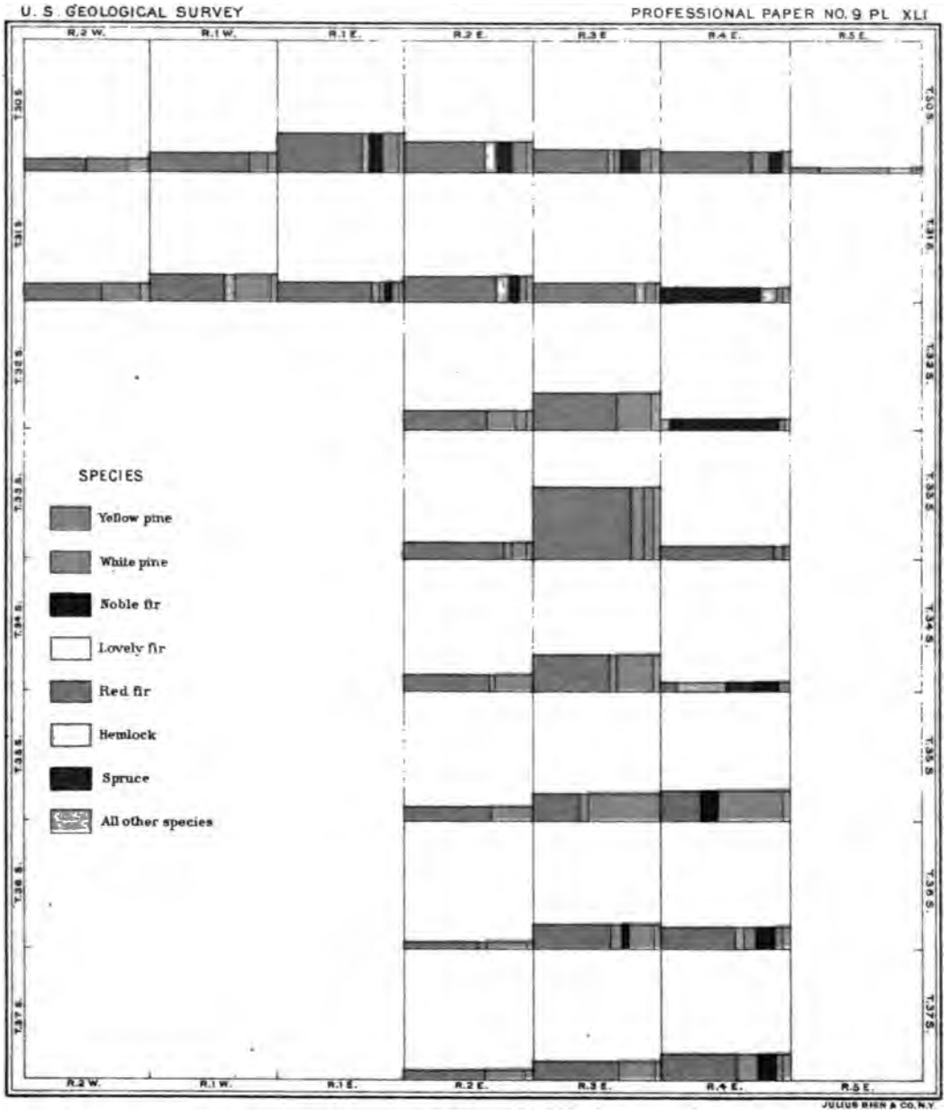
	Acres.
Forested area	23,040
Badly burned area	10,000
Logged area	None.

Total stand of timber in T. 29 S., R. 3 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine	10	4,000,000	4,000,000
Red fir	62.5	25,000,000	40,000,000
White fir	12.5	5,000,000	10,000,000
Patton hemlock	15	6,000,000	11,000,000
Total		40,000,000	65,000,000

Composition of forest in T. 29 S., R. 3 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Red fir	50
White fir	10
White pine	5
Patton hemlock	30
Lodgepole pine	5



JULIUS BIEN & CO. N.Y.

DIAGRAM OF THE SOUTHERN POINT

OF THE

CASCADE RANGE FOREST RESERVE, OREGON

showing stand and commercial species of timber

Vertical scale of stand.

1 0 1 billion feet B M.

Township 29 South, Range 4 East.

The northern half of this township is situated on the northern slopes of the Umpqua-Rogue River divide, and consists of high, rocky ridges. The southern half comprises pumice-covered levels intersected by low ridges of lava and furrowed by numerous small deep canyons, which form the upper heads of the eastern tributaries of the North Fork of Rogue River.

The run-off from the northern half of the township is large in volume, and flows into the South Umpqua. The quantity originating in the other half is of moderate volume, and empties into Rogue River through the North Fork.

There are no agricultural lands in the township. Mineral-bearing areas have been discovered along the northern slopes of the Umpqua-Rogue River divide, and some claims have been located. The region, in common with other mineral ground along this divide, carries values only in gold. The thinly wooded areas on the summits of the Umpqua ridges constitute the grazing lands of the township. Some of them are naturally thinly forested or wooded; others are grassed over as the result of fires.

The forest consists of red-fir and of Patton-hemlock stands. Most of the stands are reforestations—some after fires since the white man's occupancy; others after fires that burned while the Indians were in possession. Sixty per cent of the reforestations are composed of lodgepole pine; the balance of Patton hemlock and white pine.

The mill timber is poor in quality and of small dimensions throughout. It is inaccessible for logging operations.

The areal and timber estimates for the township are as follows:

Classification of lands in T. 29 S., R. 4 E.

	Acres.
Forested area	23,040
Badly burned area	18,000
Logged area	None.

Total stand of timber in T. 29 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine	31.3	5,000,000	5,000,000
Red fir	50	8,000,000	10,000,000
White fir	18.7	3,000,000	10,000,000
Total		16,000,000	25,000,000

Composition of forest in T. 29 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	80
Red fir	8
White fir	5
White pine	3
Patton hemlock	4

Township 29 South, Range 5 East.

This township comprises areas situated on the summit and immediate western slopes of the main range of the Cascades. Most of the tract consists of level or gently sloping areas, all very deeply pumice covered. In the northern portion of the township there are four or five sections of high, mountainous ridges belonging to the Umpqua-Rogue River divide.

The water supply of this township is trifling in amount. Most of the precipitation sinks in the immense sheet of pumice and disappears. The heads of two of the lesser tributaries of the North Fork of Rogue River lie in the central portions of the township. Each has cut out a deep but narrow canyon in the pumice. It is evident that in late years these streams have cut into the pumice at a more rapid rate than they formerly did. The widespread destruction of the growing forest by fire has no doubt contributed to this acceleration. If it be desirable to prevent the vast blanket of pumice along the summit and higher slopes of the Cascades from transfer to the low-lying valleys of the agricultural districts, it is necessary that everything tending toward the loosening of the pumice surface should be avoided.

The forest is of the Patton-hemlock type. It consists of lodgepole pine, with small groups of Patton hemlock and noble fir scattered here and there among the lodgepole. The species represent reforestation after fires. This region was burned periodically during the Indian occupancy, as the many different ages represented in the lodgepole-pine stands prove. But when the white man came into the region the areas in this particular township were covered with a uniform stand of the species. During the past forty or forty-five years the timber has been burned in many localities and the subsequent reforestations have again been burned. The region is too high in altitude to permit the growth of much brush. After a fire one of three things happens; either lodgepole pine comes as the first forest growth, or grasses and sedges form a thin, interrupted sward, or the ground remains bare of all vegetation. It is impossible to predict beforehand which one of the three phases will appear. It all depends on the extent to which the ratio of soil moisture has been disturbed and changed.

The township contains no mill timber. There are no agricultural, grazing, or mineral lands in the township.

The areal estimates are as follows:

Classification of lands in T. 29 S., R. 5 E.

	Acres.
Forested area	23,040
Badly burned area	18,000
Logged area	None.

Township 30 South, Range 1 East.

This township is mostly on the northern slopes of the Umpqua-Rogue River divide, a small portion in the northwest corner covering spurs projecting southward from the ridges between the North Umpqua and South Umpqua excepted. In some places the township consists of long, steep spurs; in others, especially in the southeast corner, the ridges have broad summits and easy slopes.

The region contains no grazing or agricultural lands. It is more or less mineral bearing throughout most of its areas, but as yet there are no mines or prospects in process of development.

This township has a large run-off. It originates in numerous small creeks that empty into the South Umpqua, which flows through the northwest corner of the township.

The forest consists of stands of yellow-pine, red-fir, and Patton-hemlock types. The yellow-pine type occurs on ridges of low elevation bordering the South Umpqua; the Patton-hemlock type on summits and high slopes along the Umpqua-Rogue River divide; the red-fir type in the canyons and on all of the areas situated at middle elevations.

The stand of timber is heavy throughout, especially along the flanks of the summit of the Umpqua-Rogue River divide, notwithstanding the fact that 50 per cent of all the timber has been visited by fire. Reforestations are abundant and are chiefly composed of red fir.

The mill timber is of good quality. The red-fir, noble-fir, and Patton-hemlock stands are largely composed of standards and veterans. The last two species form very heavy stands on the broad summits and spurs in the southeastern sections of the township. With the exception of the main valley of the South Umpqua, the forest is inaccessible for logging operations.

Classification of lands in T. 30 S., R. 1 E.

	Acres.
Forested area	23,040
Badly burned area	2,500
Logged area	None.

Total stand of timber in T. 30 S., R. 1 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	19.1	45,000,000	59,685,000
Sugar pine	2.8	6,000,000	7,958,000
Red fir	59.7	131,000,000	250,677,000
White fir	1.5	3,000,000	7,958,000
Noble fir	10	20,000,000	39,790,000
Patton hemlock	6.9	15,000,000	31,832,000
Total		220,000,000	397,900,000

Composition of forest in T. 30 S., R. 1 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine	.4
Red fir	60
White fir	3
Noble fir	10
Patton hemlock	6.5

Township 30 South, Range 2 East.

This township is situated partly on the northern and partly on the southern slopes of the Umpqua-Rogue River divide, which almost bisects the township, entering near the northeast corner and leaving near the southwest. The portion of the crest of the divide which lies within the township generally is rocky, narrow, and very tortuous, and slopes abruptly on either side to canyons of great depth. About midway in the township the crest expands into Abbots Butte, a mass of volcanic rock with an elevation of 6,500 feet. The summit of the butte is flattened, with a projecting central, rocky boss. It is about three-fourths of a mile in width and breaks off on all sides, except at one point in the northwest corner, with a precipitous wall of rock 400 to 1,500 feet in height. The sections of the township situated on either side of the Umpqua-Rogue River divide are filled with steep, precipitous spurs.

The volume of water discharged by the stream in the southern portions of the township is small and empties into the North Fork of Rogue River. The outflow from the northern areas is large and enters the South Umpqua. The areas draining into this stream are copiously supplied with large, springy, marshy tracts, situated on the sloping hillsides and at the heads of the various creeks.

The township has no agricultural land. Most of its areas are known to be mineralized, and four or five mineral claims are located on the Umpqua-Rogue River

divide a mile west of Abbots Butte. There is no development work in progress on these claims or on any others in the township.

The grazing lands consist of glades scattered throughout the summit areas and higher slopes of the Umpqua-Rogue River divide. These glades are mostly due to forest fires burning off the timber. A small number of cattle occasionally stray up here from the lowlands of the Rogue River Valley in late summer. The summit of Abbots Butte and most of the high slopes of the divide east and north of this point are used for pasturing sheep.

The forest consists of stands belonging to the three types of the region. The yellow-pine type occurs chiefly in the southwestern areas. In the northern sections there are also considerable quantities of yellow pine, but it scarcely forms a type, the species and its associates existing as scattered trees or in small groups among the red-fir stands. The Patton hemlock is the forest along the summit and higher slopes of the Umpqua-Rogue River divide. It also extends downward on the northern declivities of the divide to the 4,000-foot contour line, following the numerous wet canyon bottoms and slopes. The stands of the type are often of great density, reaching 50,000 to 75,000 feet B. M. per acre. The red fir is chiefly composed of standards, much of it running above 3 feet basal diameter and having clear trunks 60 to 90 feet in length. There are mixed with the red-fir type, and sometimes with the Patton-hemlock type as well, scattered trees and small aggregations of sugar and white pine, the individuals averaging 2 to 6 feet in diameter at the base and 40 to 90 feet in length in the clear trunk.

The region around Abbots Butte is noteworthy because it is the most southerly station known in the Cascades for the Alaska cedar. The species occurs in a few localities on the slopes of and adjoining the butte as scattered individuals in the mass of Patton-hemlock forest, occasionally forming aggregations with 300 to 400 individuals in a close growth. The species is a small tree or large shrub as it grows here, and is of no commercial value whatever.

The forest is fire marked throughout the township and 15 per cent of the standing mill timber has been consumed or killed. It is worthy of note that although the forest on the northern slopes of the Umpqua-Rogue River divide in this and the preceding township has been overrun by fire almost everywhere, the actual quantity of timber consumed is not nearly as large as might be expected considering the extent of the fires. It is doubtless due to the generally wet condition of the humus and litter that more has not been destroyed. The fires have been more severe and widespread along the summit of the divide, where the sheep pastures are found, than elsewhere. As fires in these localities decidedly encourage grass growth at the expense of the forest, there is probably some connection between the sheep camps and the fires that have ravaged the timber in their neighborhood.

The burned-over areas in the township do not reforest rapidly or well. The

tendency is toward grassy glades rather than to forest at all the higher elevations, and to dense brush growths at the lower and middle altitudes. Some of the slopes covered with pumice, or with small lapilli, are being denuded of their soil down to the lava bed rock as a result of the fires and the consequent loosening of the forest floor.

The portion of the township south of the Umpqua-Rogue River divide, about one-third of its entire area, can be logged from the Rogue River Valley, although with some difficulty. The balance of the township is inaccessible for logging operations.

Classification of lands in T. 30 S., R. 2 E.

	Acres.
Forested area	21,040
Nonforested area (burned)	2,000
Logged area	None.
Badly burned area	3,500

Total stand of timber in T. 30 S., R. 2 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	11.2	20,000,000	25,654,400
Sugar pine	5.6	10,000,000	16,896,000
White pine	.9	2,000,000	3,379,200
Red fir	61.2	110,000,000	209,889,600
White fir			3,379,200
Noble fir	10	18,000,000	41,550,400
Incense cedar			1,689,600
Patton hemlock	11.1	20,000,000	33,792,000
Mertens hemlock			1,689,600
Total		180,000,000	337,920,000

Composition of forest in T. 30 S., R. 2 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	10
Sugar pine	3
White pine	Inconsiderable.
Incense cedar	Inconsiderable.
Mertens hemlock	Inconsiderable.
Patton hemlock	13
Red fir	60
White fir	2
Noble fir	10
Subalpine fir	Inconsiderable.
Yew	Inconsiderable.
Yellow cedar	Inconsiderable.

Township 30 South, Range 3 East.

The western sections of this township are situated on the southern slopes of the Umpqua-Rogue River divide. The eastern areas comprise in part the valley bottoms of the North Fork of Rogue River and in part low, broad spurs projecting westward from the main range of the Cascades, which form a sort of plateau region.

The ridges extending from the Umpqua divide in the western portion of the township are steep and rocky and inclose broad terraced creek bottoms at frequent intervals. The valley of the North Fork of Rogue River is a depression about 2 miles wide and 600 to 800 feet in depth. The valley, so far as it lies in this township, has been scooped out through an immense deposit of pumice, and exhibits from 4 to 6 distinct terraces. The terraces on the eastern side of the stream are generally wider than those on the west. In the southern portions of the township the stream has in some places cut through the pumice deposit to the underlying lava bed rock, causing narrows and rapids to form in the channel, which elsewhere is broad and smooth.

The streams originating in the township are of small volume. They are chiefly springs which break out along the slopes of the different terraces west of the river. The springs represent a portion of the seepage coming from the slopes of the Umpqua-Rogue River divide. Although these springs discharge but a trifling amount of water, they have nevertheless succeeded in excavating deep channels through the pumice terraces between the points of issue and their entrance into the river. Some of these channels are 200 feet in depth. In time the entire pumice deposit on the west side of the river will be transported into the bed of the stream through the agency of these springs and the rivulets originating from them.

There are no agricultural lands in the township. Mineral-bearing areas are known to occur in the ridges of the Umpqua-Rogue River divide.

The grazing areas consist of marshy flats and fire glades bordering Rogue River. They occur in the south-central areas of the township and cover in the aggregate 500 or 600 acres.

The forest consists of three types. The yellow-pine type is not well developed, and exists chiefly as scattered groups among the red-fir stands and on the lower ridges in the southwest corner of the township. Most of the heavy forest is on the terraces in the bottoms of the North Fork. It is chiefly stands of red-fir type containing an unusually large percentage of noble fir. Most of the mill timber consists of standards and veterans averaging from 2 to 4 feet in diameter with clear trunks 45 to 75 feet in length. The Patton-hemlock type occurs in the extreme eastern areas. It is of small dimensions throughout.

The mountainous sections of the western tracts of the township are inaccessible for logging operations. The valley portions can easily be logged, but owing to

obstructions in the river bed by ancient lava flows, which come to the surface near the junction with Union Creek, the North Fork can not be used for driving. Above the obstructions the channel is free, broad, and 5 to 6 feet in depth during three or four months of the year.

With the exception of isolated patches of forest along the lower valley terraces, the timber is fire marked throughout the entire township. The damage has been immense. Sixty per cent of the standing mill timber has been consumed or has been so badly damaged within the past forty-five years that it is unfit for commercial purposes. This involves a loss of 250,000,000 feet B. M. in this one township. Much of the burned-over tracts has reforested with lodgepole pine, which in its turn has been burned of late years to the extent of 25 per cent. As a rule, reforestations are abundant on the valley lands, but are composed of the worthless lodgepole pine. On the slopes and highest terraces it is deficient, immensely dense brush growth of the vellum-leaved ceanothus almost invariably replacing the forest in such localities.

Classification of lands in T. 30 S., R. 3 E.

	Acres.
Forested area	19,680
Nonforested area (bare rocks and glades, 1,500; burnt area, 1,860)	3,360
Badly burned area	6,000
Logged area	None.

Total stand of timber in T. 30 S., R. 3 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	5.3	8,000,000	9,348,000
Sugar pine	6.6	10,000,000	11,686,000
White pine	2	3,000,000	4,674,000
Red fir	73.4	110,000,000	140,232,000
White fir	3.4	5,000,000	23,372,000
Noble fir	8	12,000,000	35,058,000
Incense cedar			700,000
Mertens hemlock			1,168,600
Patton hemlock	1.3	2,000,000	7,012,000
Engelmann spruce			469,400
Total		150,000,000	233,720,000

Composition of forest in T. 30 S., R. 3 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	5
Sugar pine	5
White pine	1
Lodgepole pine	10
Red fir	45
White fir	15
Noble fir	10
Incense cedar	.1
Mertens hemlock	2
Patton hemlock	5
Engelmann spruce	.1

Township 30 South, Range 4 East.

The northern and central portions consist of flats and terraces stretching westward from the main range of the Cascades. They are intersected by lava ridges of low relief and furrowed by canyons 300 to 400 feet in depth cut through the pumice deposit which deeply covers the entire township. The southern sections comprise a flat tract 2 miles in width stretching across the township from east to west.

The township has scarcely any run-off. The streams that flow through it all have their heads in adjoining townships. These streams carry large volumes of water and empty into the North Fork of Rogue River, which cuts the extreme northwest corner of the township.

There are no grazing, agricultural, or mineral-bearing areas.

The forest consists of stands of yellow-pine, red-fir, and Patton-hemlock types. The yellow pine is of poor quality and occurs as small, scattered groups in the western areas of the township. The red fir is composed largely of standards and veterans, generally of the same class and dimensions as those in the preceding township. Much of the Patton-hemlock type is of small dimensions, being reforestations after fires which burned ninety to one hundred years ago. The heaviest stands of forest occur in the northwest sections of the township, on terraces belonging to the valley of the North Fork of Rogue River.

The township is easy of access for logging operations. The streams, however, lie in too deep and narrow canyons and are too much obstructed by rocks to be utilized for driving purposes.

Practically all of the forest is fire marked. One-sixth of the entire area has been burned clean of timber, save for an occasional tree, and the remainder has lost 40 per cent of its mill timber through the same cause. The southern areas have suffered the most, but no tract has been entirely exempt. Brush growths of the

vellum-leaved ceanothus follow the fires. In a few localities lodgepole-pine reforestations are beginning to supplant the brush.

Classification of lands in T. 30 S., R. 4 E.

	Acres.
Forested area	19,740
Nonforested area burned	3,200
Badly burned area	3,200
Logged area	None.

Total stand of timber in T. 30 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	Feet B. M.	Feet B. M.
Yellow pine	2	2,000,000	4,309,200
Sugar pine	.9	1,000,000	1,077,300
White pine	1	1,000,000	1,077,300
Red fir	78.5	80,000,000	150,822,000
White fir	4.9	5,000,000	30,164,400
Noble fir	9.8	10,000,000	21,546,000
Patton hemlock	2.9	3,000,000	6,463,800
Total		102,000,000	215,460,000

Composition of forest in T. 30 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	3
Sugar pine	.1
White pine	.1
Lodgepole pine	25
Red fir	60
White fir	5
Noble fir	4.8
Patton hemlock	2

Township 30 South, Range 5 East.

This township is situated on the western slope of the Cascades. The crest of the range occupies the eastern areas. It consists of the rocky western rim of Crater Lake, which attains elevations of 8,600 feet above sea level. The crest is narrow, seldom more than 8 to 10 rods in width. On the east it breaks off by precipices 1,200 to 2,000 feet in height to the depression holding Crater Lake. On the west the crest sinks, through a series of steep escarpments, none of great height, to a terraced region, mostly of low relief, which occupies the central and western sections of the township. The entire region, except the peaks and prominent rocky

elevations and escarpments along the crest of the range, is deeply buried under a mass of fine pumice.

A large quantity of water flows out of the township. It originates at the base of the crest of the range in a series of springs and marshy tracts. The stream channels in their course westward through the township deepen rapidly and soon form canyons 200 to 300 feet in depth.

There are no agricultural lands in the township. Some of the volcanic scoria, lapilli, and pumice in the western sections of the township are said to have yielded colors of gold; otherwise there are no mineral lands.

The grazing lands consist wholly of fire glades. For many years the areas below the crest were periodically burned by sheep herders, hunters, and campers. As the region is mostly above the line of heavy brush growths, grass and sedge came in and covered the burned-over tracts with a more or less thick sward. Neither cattle nor sheep are pastured in this township at the present time.

Stands of red-fir and Patton-hemlock type form the forest. The red-fir type is the principal growth in the western areas. It is mixed with small percentages of yellow and sugar pine. The central and eastern areas are covered with stands of pure Patton-hemlock type, in which the Patton hemlock occurs as the principal component. The forest along the crest is thin. Much of it exists as small groups separated by bare pumice flats or as scattered trees, in which case such areas might perhaps be more properly classed as wooded than as forested. Elevations above 7,500 feet along the crest are rocky and nearly devoid of arborescent growth, stunted individuals of the white-bark pine being almost the only denizens of such tracts.

The mill timber is of poor quality except in the western areas, where the red fir forms the principal species in the stands. It can be logged with little difficulty except such as is naturally encountered in a region of high elevation, heavy snowfalls, and severe winters. It is accessible either from the valley of the North Fork of Rogue River or from the Klamath-Crater Lake wagon road, in the southeastern sections of the township.

Most of the township is marked by fire. The stands of Patton hemlock which occur on the crest have been burned only here and there, owing to the surrounding nonforested pumice flats which have acted as fire breaks. Below the crest the forest has been extensively burned. The largest burns of modern date run back 35 or 40 years, but for the last 100 years the forest on the terraces west of Crater Lake has been periodically burned. This is proved by the age of the lodgepole-pine stands. Reforestations of lodgepole pine follow fires at these elevations, and in the present stands of this species groups of all ages up to 100 or 110 years are represented, while decaying remains of the stands burned 35 or 40 years ago show trees of still higher age. In the last three or four years the region has enjoyed comparative immunity

from this scourge and the glades are fast reforesting except in a few of the marshy tracts too wet for forest growth.

Classification of lands in T. 30 S., R. 5 E.

	Acres.
Forested area	12,860
Nonforested area (rocks and lake, 6,000; burned area, 4,180)	10,180
Badly burned area	6,500
Logged area	None.

Total stand of timber in T. 30 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	11.1	1,000,000	1,300,000
Sugar pine	7.8	700,000	700,000
Red fir	44.4	4,000,000	5,000,000
Noble fir	11.1	1,000,000	4,000,000
Patton hemlock	25.5	2,300,000	14,040,000
Total		9,000,000	25,040,000

Composition of forest in T. 30 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	.01
Sugar pine	.01
White pine	.001
White-bark pine	.0001
Lodgepole pine	14
Red fir	8
White fir	.5
Noble fir	11.5
Patton hemlock	65
Engelmann spruce	.0001

Township 30 South, Range 6 East.

Most of this township is occupied by the well-known Crater Lake, being situated on the summit of the Cascades. The waters originating along the eastern and southern rim of the lake flow into the Klamath drainage, while that which rises in the west and north goes into Rogue River. The region is rocky and precipitous, with a mean elevation of nearly 7,000 feet, exclusive of the depression holding the lake. With the exception of a few insignificant springs in the southern areas, there is no visible run-off from the township.

There are no agricultural, grazing, or mineral lands.

The forest is entirely of the Patton-hemlock type. Half of the area is merely

wooded, scattered trees or groups of trees separated by pumice flats and rocky combs forming the aborescent growth.

The mill timber is mostly confined to the northern areas of the township and is inferior in quality. A few scattered groves of Patton hemlock occur on the southern tracts. Some of the Patton hemlocks in these stands are of large size, occasional individuals reaching 6 to 7 feet in diameter.

There are fire marks on most of the forest in the southern part of the township. Elsewhere the stands of timber are so thin and scattered that fires have never succeeded in obtaining any sort of a start.

Classification of lands in T. 30 S., R. 6 E.

	Acres.
Forested area	5,080
Nonforested area (rocks and lakes)	17,960
Badly burned area	2,500
Crater Lake	12,800
Logged area	None.

Total stand of timber in T. 30 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Noble fir	33.3	1,000,000	3,000,000
Patton hemlock	66.7	2,000,000	10,000,000
Engelmann spruce			440,000
Total		3,000,000	13,440,000

Composition of forest in T. 30 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	2
White pine	.0001
White-bark pine	2
Noble fir	.5
Alpine fir	.1
Patton hemlock	95
Engelmann spruce	.001

Township 30 South, Range 6½ East.

This township is situated on the eastern slopes of the Cascades. The western sections consist of broken, rocky tracts with a mean elevation of 7,000 feet, and contain in the southern areas Mount Scott, an extinct volcanic cone, with an elevation of 9,100 feet. The central and eastern portions comprise a mass of steep, broken ridges and spurs sloping sharply to the levels bordering Klamath Marsh at the foot

of the range. The region is volcanic throughout, as is the case with the preceding townships.

A small strip of undetermined width along the eastern edge of the township lies outside the reserve boundaries. If the western boundary of the Klamath Indian Reservation, which here nearly adjoins the forest reserve, should be found to pass along the true east line of the township, the tract now excluded ought to be annexed to the reserve.

With the exception of a few small springs, the region has no visible drainage system.

There are no agricultural, grazing, or mineral lands in the township.

The forest at the lower elevations consists of yellow pine. The stand is of good quality and easy of access from all directions except from the west.

At the upper edge of the yellow-pine forest along the 5,800-foot contour line begins the Patton hemlock type. The stands of the type at their lower range are composed of lodgepole pine; at middle altitudes Patton hemlock and noble fir form the forest; while at the highest elevations the tracts are merely wooded with sparse, scattered growth of white-bark pine, subalpine fir, and Patton hemlock. Mount Scott projects 600 or 700 feet above timber line.

A great deal of the forest shows fire marks. The entire body of yellow-pine growth has been seared repeatedly. Large fires burned there the past summer. The lodgepole-pine stands at middle elevations are the result of fires which burned before the advent of the white man. Reforestations are nearly always lodgepole pine at all elevations. Brush growths are not common.

Classification of lands in T. 30 S., R. 6½ E.

	Acres.
Forested area	21,040
Nonforested area (bare rocks)	2,000
Badly burned area	5,000
Logged area	None

Total stand of timber in T. 30 S., R. 6½ E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	72	18,000,000	52,000,000
Noble fir	12	3,000,000	5,600,000
Patton hemlock	16	4,000,000	7,000,000
White fir			3,000,000
Total		25,000,000	67,600,000

Composition of forest in T. 30 S., R. 6½ E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	60
White pine	Scattered.
White-bark pine	1
Lodgepole pine	15
White fir	1
Noble fir	5
Subalpine fir	Scattered.
Patton hemlock	17.8

Township 31 South, Range 1 East.

This township is situated on slopes of the Umpqua-Rogue River divide, a ridge separating the drainage basin of Rogue River from that of the South Umpqua River. The divide enters the township in the northeast corner and strikes through it in a direction a trifle south of west. The position of the township is thus partly on the northern, partly on the southern slopes of the divide. The crest of the ridge is a narrow, rocky hogback, 40 to 50 yards wide in some places, in other localities not more than 3 or 4 yards. In its course through the township it varies in altitude from 4,000 to 5,500 feet. It slopes off very sharply, both on the northern and on the southern declivities. The southern slopes, which form the central and southern areas of the township, consist of a large number of narrow, tortuous ridges, inclosing deep canyons. In general all the canyons in these portions of the township head sharply in the steep slopes of the divide, have narrow bottoms 2 to 4 rods wide, and very steep, often rocky sides. The northern declivities of the divide are similar to the southern, but the canyon bottoms are generally wider.

The run-off of the township is large, and flows away in two directions, namely, northward to South Umpqua River, southward to Rogue River by way of Elk Creek.

There are no agricultural lands in the township. The central portions contain a few hundred acres of grazing lands. They consist of open, park-like ridges, covered with yellow pine, where the scattered timber permits a thin growth of grass to exist. Cattle range on these tracts, but no sheep.

The township adjoins known mineral-bearing areas on the east, north, and west. While so far no mineral deposits have been discovered here, it is very probable that prospecting will eventually disclose them on both sides of the divide.

All three of the forest types which occur on the nearby slopes of the Cascades are represented in the township. The yellow-pine type is the prevailing forest at low altitudes on the southern and western slopes of the ridges. The red-fir type occupies the canyon bottoms and moist northern and eastern declivities, while the Patton-hemlock type is limited to the summit and highest slopes of the Umpqua-Rogue River divide.

The yellow-pine type is not abundant or well developed. Its stands are thin and scattering, and the component trees, yellow and sugar pine, are only of medium dimensions—20 to 30 inches in basal diameter, 15 to 20 feet clear trunks. Occasionally, however, there occur veteran sugar pines, remnants of a very old growth, whose diameters vary from 6 to 10 feet. These giants are not very common, and almost every one of them is in a state of decay, due to sears and basal burns of modern times. The red-fir type is abundant and well developed. It occurs of three ages—veterans, standards, and young growth. The veterans are mixed with sugar pine, yellow pine, and white fir, and have dimensions varying from 5 to 9 feet in diameter at the base, with clear trunks 40 to 80 feet in height. The standards occur in extensive bodies throughout the canyon bottoms. The trees average 2 to 3 feet in basal diameters, with clear trunks 40 to 60 feet in length. The young growth represents reforestations after fires which burned the forest one hundred years ago. Stands of this kind are chiefly confined to the northern slopes of the divide, where they appear to have replaced growths of Patton-hemlock type.

The Patton-hemlock type is composed mostly of noble fir and Patton hemlock in almost equal proportions. Previous to fires, originating since the white man's occupancy of the region, the stands of this type were of magnificent proportions. To judge from the remains there were large areas which carried more than 100,000 feet B. M. per acre. The best stands were composed of large veteran trees 2½ to 3½ feet in diameter at the base, with long columnar trunks 50 to 60 feet in the clear. Little remains now but the fire-killed trunks.

Ninety per cent of the forest in the township is fire marked. Forty per cent of the standing timber has been consumed by fire within the past forty-five years, but no area has been burned completely off; there is always some little timber left. Most of the burned-over areas are reforesting, principally with red fir. A few of the southern slopes are becoming brush covered, dense thickets of rhododendron and of vellum-leaved ceanothus occupying the ground.

The southern areas of the township are readily accessible to logging operations by way of the various canyon bottoms. The central portions can be reached only with difficulty, while the summit and higher slopes are practically inaccessible.

Classification of lands in T. 31 S., R. 1 E.

	Acres.
Forested area	23,040
Badly burned area	7,000
Logged area	None.

Total stand of timber in T. 31 S., R. 1 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Fect B. M.*	*Fect B. M.*
Yellow pine	8.8	10,000,000	16,500,000
Sugar pine	2.7	3,000,000	3,000,000
Red fir	70.8	80,000,000	160,000,000
Noble fir	7.1	8,000,000	11,000,000
White fir			8,000,000
Incense cedar			620,000
Patton hemlock	10.6	12,000,000	14,000,000
Total		113,000,000	213,120,000

Composition of forest in T. 31 S., R. 1 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	10
Sugar pine	1
White pine	.005
Lodgepole pine	.5
Incense cedar	.005
Oaks, etc	1
Red fir	60
White fir	6
Noble fir	10
Subalpine fir	.0005
Patton hemlock	10

Township 31 South, Range 2 East.

This township mostly comprises areas on the southern declivities of the Umpqua-Rogue River divide, a small portion in the northwest corner overlapping on the northern side of the ridge. The entire tract consists of a mass of rough, steep, rocky ridges radiating from the Umpqua-Rogue River divide, and inclosing narrow canyons with precipitous slopes. The southern and portions of the central areas consist of volcanic rocks of the same composition as like formations in the Cascades. The northern sections consist chiefly of porphyries and similar ancient eruptive rocks.

The run-off from the township is of small volume. That from the central and western areas reaches Rogue River by way of Elk Creek, while that which originates in the eastern sections flows into North Fork of Rogue River through a number of small creeks.

There are no agricultural lands in the township. The grazing lands consist of small marshy glades at the heads of various streams. Few of the glades are really open or meadow-like, most of them carrying scattered groups of trees. Cattle range throughout the township, subsisting on browse and on the trifling amount of grass the glades are capable of supplying. There are no sheep regularly pastured,

but occasionally bands are driven across the township to grazing grounds in the adjoining township on the north, T. 30 S., R. 2 E.

The northwestern portion of the township is mineral bearing, and a number of claims, said to be of promising appearance, have there been lately opened.

The forest consists of stands belonging to the yellow-pine, red-fir, and Patton-hemlock types. The latter type inhabits the region in the northern portion of the township along the summit and upper slopes of the Umpqua-Rogue River divide. The yellow-pine and red-fir types occur on the lower slopes and in the bottoms of canyons.

The western and some of the central portions of the township have been badly burned. No tracts have been swept completely clean, thin stands or scattered trees occurring on all of the fire-marked areas. The eastern sections contain large quantities of good mill timber, red fir in standard dimensions being the prevailing species.

The western and central sections are difficult of access; the eastern can be logged from the Rogue River bottoms on the east.

Classification of lands in T. 31 S., R. 2 E.

	Acres.
Forested area	23,040
Badly burned area	8,500
Logged area	None.

Total stand of timber in T. 31 S., R. 2 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	9.8	18,000,000	23,467,200
Sugar pine	4.9	9,000,000	9,850,000
Red fir	65.5	120,000,000	205,338,000
White fir			6,000,000
Noble fir	5.4	10,000,000	14,000,000
Incense cedar	.6	1,000,000	1,684,000
Patton hemlock	13.7	25,000,000	33,000,000
Total		183,000,000	293,339,200

Composition of forest in T. 31 S., R. 2 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	10
Sugar pine	2
Red fir	65
White fir	3
Noble fir	5
Patton hemlock	15
Incense cedar	.01

Township 31 South, Range 3 East.

The western sections of this township consist of low, rocky terminations of spurs radiating from the Umpqua-Rogue River divide. The central sections comprise a strip of terraced bottom land 2 miles wide, stretching through the township from north to south, deeply covered with pumice débris, and constituting the valley, in part, of the North Fork of Rogue River. The eastern areas consist of a steep, rocky escarpment falling away to the west from the summit of Huckleberry Mountain, a volcanic plateau-like tract in some of its portions, and connected with the main range of the Cascades in its southeastern corner.

The run-off from the township is small and is carried by the North Fork of Rogue River. The bed of the stream lies between low banks 4 or 5 yards in height. Its current is rapid, but is interrupted in several localities by dikes of lava, through which the stream has cut narrow rocky channels.

There are small tracts of grazing and hay lands bordering the river, 500 or 600 acres in all; otherwise there are no clear lands in the township. The Rogue River bottoms, now heavily forested, would probably become agricultural in character were the timber cleared off. This would give 4,000 or 4,500 acres of such land to the township.

The forest is made up of all the types in the region. The yellow-pine type occurs in the western portions chiefly, and in detached patches mixed with red-fir type in the Rogue River bottoms, where it exists as reforestations after fires, and in the natural course of events will be supplanted by red fir. The chief stands of the red-fir type occur on the bottom lands. It is a massive forest, composed almost wholly of veterans and standards. Much of it is of large dimensions. The red fir averages 2 to 4 feet in diameter, with clear trunks 50 to 100 feet in height; the sugar pine is about the same size for standards, while veterans are often found that are 7 to 8 feet in diameter, with clear trunks 40 to 60 feet in length. Unfortunately there is not a great deal of this sort of forest, which only occurs on the lowest terraces of the bottom lands. The tract can be logged with the greatest facility, and appears to be held wholly by private owners who long since acquired title to it. The Patton-hemlock type occurs on the slopes leading up to the summit of Huckleberry Mountain. It is of poor quality and practically inaccessible for logging operations.

With the exception of red-fir stands on bottom lands the forest has been marked by fire throughout the township. The slopes of Huckleberry Mountain have especially suffered severely.

Reforestation is scanty everywhere; it is practically lacking on Huckleberry Mountain, where heavy brush growths flourish on all the fire-swept areas.

There are no mineral-bearing areas in the township.

Classification of lands in T. 31 S., R. 3 E.

	Acres.
Forested area	10,880
Nonforested area (glades and meadows, 4,000; burned, 8,160)	12,160
Badly burned area	15,000
Logged area	None.

Total stand of timber in T. 31 S., R. 3 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	3.3	5,000,000	8,000,000
Sugar pine	5.2	8,000,000	9,000,000
White pine			1,000,000
Red fir	88.8	135,000,000	150,000,000
White fir	2.6	4,000,000	12,000,000
Noble fir			2,000,000
Mertens hemlock			480,000
Patton hemlock			1,200,000
Total		152,000,000	183,680,000

Composition of forest in T. 31 S., R. 3 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	6
Sugar pine	2
White pine	.1
Lodgepole pine	.5
Red fir	75
White fir	12
Noble fir	3
Subalpine fir	.25
Mertens hemlock	.01
Patton hemlock	.5

Township 31 South, Range 4 East.

Most of this township consists of tracts comprised within the lines of Huckleberry Mountain, a volcanic mass rising to a height of 6,000 feet, and connected with the main range of the Cascades by a narrow ridge in the southeastern angle of the township. The summit of Huckleberry forms a sort of plateau broken by a few minor depressions and low combs. On its southern side the mountain slopes gradually into Red Blanket Canyon. On the north it presents a bold and steep front to the Rogue River Valley, while on the east there is a steep descent to the narrow

bottom of Union Creek. The region is covered with a blanket of fine pumice, which is not very thick on Huckleberry Mountain, but is of unknown depth in the northern portions of the township at the base of the mountain. The drainage discharged from the township is large in volume and flows out by way of Union Creek into the North Fork of Rogue River.

The township contains no agricultural lands. The grazing areas consist of fire glades on the top of the mountain. There is a thin and sparse growth of grass and sedge everywhere on the burned tracts. In the center of the township the glades originated centuries ago and carry a close, thick sward of grass.

No mineral-bearing lands occur in this township.

Fire has marked all of the forest. Almost one-half of the entire area in the township has had all its forest swept off clean. Some of the burns are very old; many are of quite recent origin. In the latter there is a vast accumulation of litter ready for fresh conflagrations. Reforestation is scanty, in most places entirely lacking. The burned tracts are covered with thin growths of grass or overrun with blackberry brambles and huckleberry brush. The burns constitute the famous huckleberry patch of the Klamath Indians. When berries are ripe, Indians and white men, women, and children, from within a radius of 100 miles, congregate here to pick berries. As reforestation would inevitably spoil the berry patch, the incentive to fire setting is great with these people.

Most of the forest is composed of stands belonging to the Patton-hemlock type. The heaviest growth occurs adjacent to and in the canyon of Union Creek. Anterior to the fires set by the white man, the larger portion of the mountain contained many heavy stands of noble fir and white pine. The timber that is untouched by fire is of fair quality, but most of it is inaccessible to loggers. In Union Creek Canyon occurs the largest and purest growth of Mertens hemlock to be found in the southern part of the Cascade Range Forest Reserve. The trees are small, however, averaging 18 to 22 inches in diameter at the base, with clear trunks 20 to 30 feet in length. Yellow pine, red fir, and incense cedar occur in small quantities in the northern portion of the township at the base of the mountain.

Classification of lands in T. 31 S., R. 4 E.

	Acres.
Forested area	14,720
Nonforested area (burned)	8,320
Burned-out area	8,320
Logged area	None.

Total stand of timber in T. 31 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine			1,000,000
Sugar pine			1,000,000
White pine	6.6	5,000,000	6,000,000
Red fir			4,200,000
Noble fir	79	60,000,000	98,000,000
Incense cedar			600,000
Mertens hemlock	4	3,000,000	8,000,000
Patton hemlock	10.4	8,000,000	13,400,000
Total		76,000,000	132,200,000

Composition of forest in T. 31 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	.01
Sugar pine	.01
White pine	3
Lodgepole pine	15
Incense cedar	.001
Red fir	.5
White fir	2
Noble fir	70
Mertens hemlock	5
Patton hemlock	4

Township 31 South, Range 5 East.

With the exception of its southeast corner, this township is situated on the western slope of the main range of the Cascades. Two-thirds of the area included within its limits consist of tracts nearly level or with very gentle slopes toward the east. In the eastern sections rocky combs and low volcanic cones break up the level surface, while near the southern boundary, Union Peak, surrounded by rough lava masses, rises to a height of 7,881 feet above sea level. The northern portions of the township consist of a low range of lava hills with an east-west direction. Pumice débris, mostly fine, but occasionally in bowlder-like masses, covers all of the township excepting the summits of the extinct volcanoes and a number of rocky escarpments too steep to hold the pumice in place.

The visible run-off originating in the township is small, and flows into Rogue River by way of Castle Creek. The channel of this stream is sunk in a canyon 300 to 350 feet in depth, excavated in the loose pumice.

There are no agricultural or mineral lands in the township. The grazing area embraces the entire tract, exclusive of Union Peak, and consists wholly of areas on which the forest has been burned, there being no natural meadows in the region. The grass growth is sparse and scattered. In former years sheep were pastured everywhere in the township, but during the last two years none have been there.

Exclusive of a few stands of red fir and yellow pine in the northwest corner of the township, the forest is of the Patton-hemlock type. Eighty per cent of the timber has been burned since the white man's occupancy, and the burned-over tracts, which originally carried stands of noble fir and Patton hemlock, have reforested with thin and scattered stands of lodgepole pine or are without forest cover. Most of the present forest consists of this species. Fires within recent years have destroyed considerable quantities of these reforestations. Owing to the altitude of the township, 6,000 feet in the mean, brush growths do not flourish. Hence fires are followed by a thin sward of coarse grass and sedge, which, after a lapse of some years, becomes covered with stands of lodgepole pine, the forerunner of the Patton-hemlock type proper, of noble fir, and Patton hemlock. Sixty per cent of the area of the township is covered with this transition type of forest. The glades due to recent fires are not reforesting to any great extent, but bear preliminary grass growth or are devoid of vegetation, save for a few scattered weeds and high altitude plants.

The mill timber is of poor quality and is widely scattered, mostly in localities where barren, rocky ground prevented the spread of fires. To the south and east of Union Peak are a few heavy stands of Patton hemlock and noble fir. Most of the township is accessible for logging operations by way of the present Fort Klamath-Rogue River wagon road.

Classification of lands in T. 31 S., R. 5 E.

	Acres.
Forested area	20,480
Nonforested area (bare rocks)	2,560
Badly burned area	4,000
Logged area	None.

Total stand of timber in T. 31 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine			200,000
Red fir			680,000
Noble fir	50	10,000,000	20,000,000
Patton hemlock	50	10,000,000	36,000,000
Total		20,000,000	56,880,000

Composition of the forest in T. 31 S., R. 5 E., including trees of all species with diameters of 4 inches and upward.

	Per cent.
Yellow pine	Scattered trees in Union Creek Canyon.
Sugar pine	Scattered trees in Union Creek Canyon.
White pine	Scattered trees in Union Creek Canyon.
Lodgepole pine	40
Red fir	Scattered trees in Union Creek Canyon.
White fir	Scattered trees in Union Creek Canyon.
Noble fir	3
Subalpine fir	Scattered.
Patton hemlock	56

Township 31 South, Range 6 East.

This township is situated mostly on the eastern slopes of the Cascades, a hundred acres in the northwest corner extending over on the western slope.

Almost the entire township consists of high, rocky, lava ridges varying in elevation from 6,000 to 7,000 feet, with occasional flats between them and on their summits. Most of the region is pumice covered.

A large volume of water flows out of the township. It is carried by Anna and Sun creeks, which head in large springs near Crater Lake. The streams lie in deep canyons, the one containing Anna Creek being noteworthy on account of its gorge-like character.

The township contains no agricultural lands. There are small tracts of grazing land consisting of fire glades now in process of reforestation. Sheep were pastured in the western sections of the township in former years. There have been none in the last two or three years.

The forest consists of stands of Patton-hemlock type. It is fire marked throughout. Fifty per cent of the timber has been burned by fires originating since the coming of the white man, but long before his advent the region was periodically burned over. Most of the forest consists of reforestations of lodgepole pine, or of small-growth Patton hemlock, white pine, and noble fir, which are gradually supplanting the lodgepole pine. Some of these reforestations are in a fair state of preservation; others have been badly burned in recent years. Much of the area here termed forested contains only scattered trees and might, perhaps, be more appropriately classed as wooded. This is the case with all the areas in the northern sections adjoining Crater Lake, which naturally are barren and rocky and carry only small amounts of arborescent vegetation in thin, widely scattered stands.

The mill timber is of poor quality throughout. Most of it occurs on rough lava ridges situated between the canyons of Anna and Sun creeks in the central portions of the township. The crest of the Cascades, a narrow comb of lava in the western

areas, carries a few heavy stands of Patton hemlock and noble fir. The region is inaccessible for logging operations.

Classification of lands in T. 31 S., R. 6 E.

	Acres.
Forested area	21,440
Nonforested area (bare rocks)	1,600
Badly burned area	4,000
Logged area	None.

Total stand of timber in T. 31 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine			5,000,000
White fir			5,000,000
Noble fir	40	10,000,000	15,000,000
Patton hemlock	60	15,000,000	25,000,000
Engelmann spruce			520,000
Total		25,000,000	50,520,000

Composition of forest in T. 31 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	Occasional trees.
Sugar pine	Occasional trees.
White pine	0.5
White-bark pine	Occasional trees.
Lodgepole pine	30
White fir	3
Noble fir	10
Subalpine fir	Occasional trees.
Patton hemlock	56
Engelmann spruce	.001

Township 32 South, Range 4 East.

The position of this township is well over on the western declivities of the Cascades. It comprises rocky and mountainous slopes draining partly into Red Blanket Canyon and partly into the canyon of the Middle Fork of Rogue River. The southern areas are especially rocky and broken, a point named Bessie Rock being the nucleus for a system of deeply sculptured ridges and canyons. In the extreme southern part of the township, where the ridges that center in Bessie Rock break off to the canyon of the Middle Fork, they present a front 2,800 feet in height. The soil everywhere is thin and mostly composed of pumice. Much of it appears to have been washed away as a result of forest fires.

The drainage channels consist of the middle portions of Red Blanket Creek and

a 4 or 5 mile section of the Middle Fork of Rogue River. Red Blanket is a small stream and carries a moderate volume of water.

The township contains no grazing or agricultural lands and no known mineral-bearing areas.

The forest belongs wholly to the Patton-hemlock type. Formerly many of the stands of noble fir and Patton hemlock must have been of fine proportions. Within the last forty years fires have laid low most of the timber and damaged that which still stands on root. The fires have been hot and have covered a large area. On the slopes facing the Middle Fork Canyon one may look up and down for miles and not see many trees. On most of the burned-over area there is practically no reforestation. Brush has taken the place of the forest and apparently is in permanent possession.

Most of the mill timber is of small dimensions and is damaged by fire. Much of it consists of noble fir. On the south side of Red Blanket there is now and then a stand where this species averages 30 inches in diameter at the base, with clear trunks 30 to 40 feet in length.

With the exception of limited tracts in the extreme western sections the areas of the township are inaccessible for logging operations.

Classification of lands in T. 32 S., R. 4 E.

	Acres.
Forested area	10,040
Nonforested area (burned)	13,000
Badly burned area	13,000
Logged area	None.

Total stand of timber in T. 32 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine	5.8	3,000,000	5,000,000
Noble fir	88.3	45,000,000	90,000,000
Mertens hemlock	2	1,000,000	3,000,000
Patton hemlock	3.9	2,000,000	7,960,000
Total		51,000,000	105,960,000

Composition of forest in T. 32 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
White pine	2
Red fir	Inconsiderable.
Subalpine fir	Inconsiderable.
Noble fir	88
Mertens hemlock	3
Patton hemlock	5

Township 32 South, Range 5 East.

This township occupies areas on the summit and western slopes of the Cascades with the exception of a few hundred acres in the northeast and southeast angles, which overlap on the eastern side of the range. The summit of the Cascades strikes through the township from north to south along its east line. In the northern and in the southern portions the summit is a broad, pumice-covered level in some places a mile in width with only a few low combs interrupting the flat surface. In the central portions many cross ridges and isolated rocky buttes break up the summit level of the range into an irregular, comparatively narrow crest. Most of the township consists of a basin-like tract hemmed in on the north, east, and south by terraced lava flows which had their origin partly in Union Peak, a volcanic center in the next township north, partly in various vents along the main summit in the central and southwestern areas of the township.

The drainage from the township is small in volume. Most of it is carried by Red Blanket Creek, which has its rise in the eastern sections. An insignificant quantity finds its way into the Middle Fork of Rogue River. Evidently the larger portion of the annual precipitation which falls on the areas of the township sinks in the loose pumice and fissured lava and is lost to view.

No agricultural lands exist in the township. The grazing areas contain in the aggregate 1,500 acres and consist exclusively of fire glades which are reforesting more or less rapidly. Cattle and sheep were pastured in the township in former years. None have been there in recent years.

The forest is of the Patton-hemlock type throughout. It occurs in stands of many different ages, each group or aggregation occupying small areas surrounded and separated by extensive tracts of burned-over ground. Fires of modern times have destroyed 60 per cent of the forest. Not all of the fire glades and burned-over tracts are due to the white man. Very many date back to the Indian occupancy. The township appears to have been peculiarly exposed to forest fires from as far back as it is possible to trace the history of the present forest. Reforestations consist of lodgepole pine and Patton hemlock, the former species predominating. Owing to the altitude at which the township is situated, 6,000 feet in the mean, brush growths after fires are lacking. If a return to forest cover does not take place, then the ground either remains bare of vegetation or a thin, interrupted sward of sedge and grass comes in.

Most of the mill timber is of inferior quality, besides being composed of species of no value from the lumberman's point of view. The altitude of the region averages too great for extensive stands of large timber in this latitude, but occasional stands of Patton hemlock, 200 to 300 years old, exhibit fine proportions. At this elevation the species usually grows in close groups, composed of ten or twenty individuals collected together on what appears to be a common root. Such

close growth develops clear trunks, although not commonly of large diameters. Stands of this character sometimes run as high as 25,000 feet B. M. per acre. Their extent is, however, quite limited.

The areas of the township are inaccessible for logging operations, and no mineral-bearing ground is there known to occur.

Classification of lands in T. 32 S., R. 5 E.

	Acres.
Forested area	11,440
Badly burned area (nonforested, deforested by fires)	11,600
Logged area	None.

Total stand of timber in T. 32 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine	3.5	1,300,000	1,900,000
Noble fir	26.8	10,000,000	14,000,000
Mertens hemlock			600,000
Patton hemlock	69.7	26,000,000	52,000,000
Engelmann spruce			460,000
Total		37,300,000	68,960,000

Composition of forest in T. 32 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
White pine	1
Noble fir	12
Subalpine fir	2
Lodgepole pine	15
Patton hemlock	68
Other species	2

Township 32 South, Range 6 East.

The position of this township is on the eastern slope of the Cascades. The western portion consists of a strip of the summit of the range. It is pumice covered throughout, level in some places, while in others it is made up of lava combs, with one conspicuous truncate volcanic cone locally known as "Goose Nest."

The central portions consist of many lava terraces and low ridges, the whole constituting a long, gradual slope to the foot of the range. The eastern sections comprise flat, level tracts but slightly elevated above the marshy tracts at the north end of Upper Klamath Lake, which barely reach beyond the lines of the township in the southeast angle.

With the exception of a few insignificant springs, the township possesses no

visible stream within its boundaries. The northeastern portions are intersected by Anna Creek, a stream heading in the township adjoining on the north. Where the stream enters the township its bed is sunk in a canyon 350 to 400 feet in depth, with nearly perpendicular walls, and having a width of about 100 yards at its brink. After emerging from the lava flows and terraces in which the canyon is sunk, the stream flows the balance of the way through the township in a channel with banks 10 to 15 feet in height. Its water is used by settlers in the adjoining township on the east for purposes of irrigation.

The township has a small amount of land which, when cleared and irrigated, can be used for grazing and agricultural purposes. The total amount is in the neighborhood of 1,000 acres. At present the tract carries an open and scattered growth of yellow and lodgepole pine. There is a thin sward of grass and sedge among the trees, and the land is at present utilized for a cattle range.

No mineral-bearing areas are known to occur.

The forest consists of stands of yellow-pine and Patton-hemlock types. It is fire marked throughout. Most of the old and standard growth of Patton-hemlock type has long since been burned, and reforestations, made up of lodgepole pine, white pine, and Patton hemlock of small size and in dense, thick stands, have taken the place of the former forest. The stands of yellow-pine type have been grievously thinned by the fires, and dense masses of underbrush, composed almost exclusively of the vellum-leaved ceanothus, have occupied the place of the burned forest.

The only mill timber in the township of any commercial value at the present time is the yellow pine. It is only of medium quality, being defective from fire sears and unusually knotty in the trunk. It is easy of access, as it grows only on the lowest levels. The white fir is generally too knotty and short of trunk to be of any value; besides a large proportion, fully 50 per cent, is defective, owing to rot induced by fire. The logging operations have been confined to culling the sugar pine for the use of settlers in adjoining townships to the east.

The areal and timber estimates for the township are as follows:

Classification of lands in T. 32 S., R. 6 E.

	Acres.
Forested area	20,440
Nonforested area (meadows, glades, and agricultural)	2,600
Badly burned area	5,000
Logged area (culled over)	1,000

Total stand of timber in T. 32 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	76.3	42,000,000	65,000,000
White pine			3,000,000
White fir	18.2	10,000,000	30,000,000
Noble fir			1,480,000
Patton hemlock	5.4	3,000,000	10,000,000
Total		55,000,000	109,480,000

Composition of forest in T. 32 S., R. 6 E., including trees of all species with basal diameter of 4 inches and upward.

	Per cent.
Yellow pine	24
Sugar pine	Scattered trees.
White pine	.2
Lodgepole pine	30
Engelmann spruce	Scattered trees.
Cottonwoods, etc	1
Red fir	Scattered trees.
Noble fir	1
White fir	6
Subalpine fir	.1
Patton hemlock	37

Township 33 South, Range 4 East.

This township is situated wholly on the western slope of the Cascades, its areas consisting almost entirely of a series of broad, flat terraces between the Middle Fork and South Fork of Rogue River. The canyons of these streams are sunk 300 or 400 feet below the terrace levels, but where the terraces end on the north side of the Middle Fork a lava rim rises to a height of 2,000 feet above the bottom of the canyon.

There are no agricultural or grazing lands in the township.

The run-off flows out by way of the two Rogue River forks. There are no other streams. They carry a large volume of water, have a swift current, and their beds are littered with large bowlders. The South Fork is much the worse in this respect, as it heads in regions that have been subjected to intense glaciation.

The forest belongs to the red-fir type. It has been terribly devastated by fires of modern origin and contains but a fraction of the mill timber that it formerly did. Owing to its location between the two forks of Rogue River access to it for purposes of logging is extremely difficult.

Classification of lands in T. 33 S., R. 4 E.

	Acres.
Forested area	13,140
Nonforested area (chiefly burns)	9,900
Badly burned area	11,000
Logged area	None.

Total stand of timber in T. 33 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine			1,000,000
Sugar pine	5	4,000,000	6,500,000
Red fir	95	76,000,000	108,000,000
White fir			12,480,000
Total		80,000,000	127,980,000

Composition of forest in T. 33 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	Scattered trees.
Sugar pine	5
White pine	Scattered trees.
Red fir	80.8
White fir	10.2
Incense cedar, yew, etc	4

Township 33 South, Range 5 East.

Twenty thousand acres of this township are situated on the west slopes of the Cascades and about 3,000 acres on the eastern declivities. The crest line of the range lies along the east line of the township, except in the northeast and southeast corners, where a slight deviation to the west places portions of the township on the eastern slopes of the range.

The western and central areas consist of rocky and precipitous tracts. Especially noteworthy in this respect is the canyon of the Middle Fork of Rogue River. This stream heads in the south-central areas, with three main branches. The northern one lies in a broad shallow canyon not particularly remarkable, but the southern branch runs in a canyon that has for its west or southwest wall a bluff of lava nearly 2,000 feet in thickness or height. This great mass appears to have issued from two of the craters belonging to the group of five mentioned as occurring in T. 34 S., R. 5 E. The wall of lava presents an immense front to the east; its slopes are extremely steep and rocky and sparsely covered with timber. The opposite or eastern side of the canyon, the course of the stream being northerly in this township, consists of broken terraces and spurs having a moderately easy gradient to the summit of the

range. In the northwest corner of the township the stream bends abruptly to the west. The north wall of the canyon is here formed by the front of a mass of lava projected southward from the volcanic area around Union Peak 10 or 12 miles to the north. The front of this lava flow has a thickness from the bottom of the canyon to its summit of nearly 2,800 feet. The eastern portions of the township are formed by the summit of the Cascades. In the southern sections the summit consists of a steep, narrow ridge of lava which ends in the central sections, where the crest is either a succession of narrow lava terraces or a level expanse, in some places fully a mile in width. In the southern portions of the township begins the pumice deposit, which from now on northward covers most of the summit and higher slopes of the range.

The run-off from this township is large. It is probably greater in volume than all the visible drainage from the twelve townships in the reserve south of this one. The outflow is all by way of the Middle Fork of Rogue River. Two of the chief affluents of the fork head directly against the crest of the Cascades. The southern of the two branches has its head in a number of small lakes which are sunk in the hollows of various extinct craters. The northern branch originates in a series of springs, hundreds in number, many of them with a large volume of water. They issue from cracks in a towering bluff of lava, and form a good-sized river in the space of a quarter mile. In addition to these chief branches there are many smaller creeks in the township which feed the volume of the Middle Fork.

No land fit for agriculture exists in the township nor anything that can properly be classed as grazing lands. Some of the fire glades bear scant growth of grass, and sedgy margins border many of the little creeks near the summit of the range. No cattle or sheep are pastured in the township. None of the areas are mineral bearing.

The forest is strictly of the Patton-hemlock type. It has been badly burned and is fire marked throughout. More than half of it is burned to the extent of 50 per cent and over and 25 per cent has been totally destroyed. I doubt if there is a tract of forest as large as 100 acres not fire marked. Reforestation is extremely scanty. Where the forest has not been completely destroyed a thin, sparse growth of lodgepole pine and Patton hemlock is struggling to maintain itself against heavy snows and winds. Where the timber has suffered total destruction low brush growths are covering the ground. The most prominent and abundant species of brush in these growths is the thin-leaved huckleberry—the common huckleberry of all this region. About 2,500 or 3,000 acres of the township have been transformed from forest into a huckleberry patch.

The mill timber is generally of small stature and diameter. An exception is the Patton hemlock in the canyon of the North Branch of the Middle Fork. The growth is remarkably large, but is overmature and in a state of decay. Much of the stand is from 80 to 100 feet in height, 2 to 3 feet in diameter at the base, with clear

trunks 30 to 60 feet long. Throughout all of its parts the township is entirely inaccessible for logging operations.

Classification of lands in T. 33 S., R. 5 E.

	Acres.
Forested area	16,540
Nonforested area (bare rocks, 700; burned, 5,800)	6,500
Badly burned area	9,500
Logged area	None.

Total stand of timber in T. 33 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Patton hemlock	84.4	65,000,000	108,000,000
Noble fir	13	10,000,000	14,300,000
Engelmann spruce	2.6	2,000,000	2,000,000
Total		77,000,000	124,300,000

Composition of forest in T. 33 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent
Patton hemlock	85
Noble fir	12
Lodgepole pine, Subalpine fir, Engelmann spruce	3

Township 33 South, Range 6 East.

This township lies almost entirely on the eastern slope of the Cascades, a small area in the western sections, which are situated on the summit of the range, overlapping on the western slope. The summit of the Cascades here consists of a broad, pumice-covered tract, quite level in some places, in other localities intersected with low combs of lava sloping off toward the eastern foot of the range in a succession of narrow terraces. Dotting the summit here and there are a number of small, flat-topped volcanic cones long extinct, but geologically of recent origin. With the exception of steep breaks of the terraces and ridges along the summit, the region is deeply covered with a mantle of pumice débris. The central portions of the township consist in part of terraced lava flows from the main range, and in part of great spurs of volcanic rock ejected from vents along the slopes of the range. The eastern portions comprise flat, muddy, and partly overflowed lands bordering the swampy areas which fringe the north end of Upper Klamath Lake.

The run-off from the township is mostly carried by Sevenmile Creek, a stream heading exactly on the summit of the Cascades in a low, broad, flat saddle to the

northwest of Klamath Point. Its head lies close up against the headwaters of the middle of the three branches of the Middle Fork of Rogue River. The topographical arrangement of the region is such that it would be an easy matter to cause a considerable volume of the water now going into the Middle Fork to flow into the canyon of the Sevenmile, and a cut 50 or 75 feet in depth through the pumice crest of the range would divert most of the upper drainage of this branch of the Middle Fork over to the eastern slope. None of the streams in the township is utilized for irrigation purposes.

About 1,000 acres in the northeast sections of the township can be put to grazing and agricultural use. Most of this tract is covered with lodgepole pine, and portions are periodically subject to overflow from Sevenmile Creek. This area is already occupied by settlers. Outside of this there are no grazing or agricultural lands in the township.

All three of the forest types belonging to the region are represented. The yellow-pine type is the prevailing one at the lowest and middle elevations. The red fir type occurs as small stands interspersed among the yellow pine. At all the higher altitudes Patton hemlock is the prevailing forest type. Fires have marked the entire forested area in the township, and have swept clean of living timber large tracts. At high elevations there is a slow reforestation process setting in, with lodgepole pine as the leading component. At middle and low elevations brush growths are in the ascendancy on the burned-over tracts.

The mill timber is of poor quality throughout. Most of it is inaccessible for logging operations.

Classification of lands in T. 33 S., R. 6 E.

	Acres.
Forested area	12,940
Nonforested area (chiefly the result of fires)	10,100
Badly burned area	8,000
Logged area	None.

Total stand of timber in T. 33 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	14.8	4,000,000	8,000,000
Sugar pine	11.1	3,000,000	3,000,000
White pine	7.4	2,000,000	2,000,000
Red fir	.....	.....	1,000,000
White fir	.....	.....	10,000,000
Noble fir	11.1	3,000,000	5,000,000
Patton hemlock	55.5	15,000,000	23,000,000
Engelmann spruce	.....	.....	400,000
Total	.....	27,000,000	52,400,000

Composition of forest in T. 33 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	3
Sugar pine	1
White pine	.8
Lodgepole pine	30
Red fir	.1
White fir	15
Noble fir	10
Subalpine fir	.03
Patton hemlock	39
Engelmann spruce	.1

Township 34 South, Range 4 East.

The position of this township is west of the main range of the Cascades. It is separated from the slopes leading directly to the summit of the range by the intervening canyon of South Fork of Rogue River. This canyon enters the township at its southeastern corner and cuts across it in a northwesterly direction. About two-thirds of the township areas are comprised in the bottom and slopes of this canyon. The remainder, the western sections, consists of western declivities of the divide between South Fork of Rogue River and North Fork of Big Butte Creek. Almost the entire area of the township is rocky and abounds in precipitous slopes. Where these have a more gentle gradient they are strewn with bowlders and smaller fragments of glaciated lava. The ridge which bounds the South Fork Canyon on the west is especially rocky and bowlder strewn. The bottom of the canyon is littered with glacial débris, such as lava blocks torn off the inclosing canyon walls or transported from the base of Mount Pitt. There are also gravel terraces, which mark the former existence of lateral and terminal moraines.

The drainage of the township flows into Rogue River, most of it by way of the South Fork of this stream, only an inconsiderable quantity by way of North Fork of Big Butte Creek. The volume of water in the Rogue River Fork is small until near its point of exit from the township, where it is greatly augmented by the entrance of a large tributary from the east and by the quantity received from numerous big springs issuing from under the lava.

The township contains no agricultural land. The grazing areas consist of fire glades in the western portions—slopes which were burned over thirty or forty years ago and have neither become reforested nor grown up to brush, but are covered with a scanty sward of coarse grass or sedge. Cattle in small numbers range on these fire glades. No sheep are pastured in the township. None of the lands are mineral bearing so far as known.

The forest in the township consists mainly of stands belonging to the Patton-hemlock type. Small tracts bearing stands of red-fir type occur in the southwest

corner. Most of the timber is of small size, averaging less than 18 inches in basal diameter, and is defective from various forms of rot due to severe and often recurring fires.

Forest fires have ravaged large areas of the township. The larger portions of the central regions have been utterly laid waste through this cause, the burns being northward extensions of the great fireswept areas in township 35 adjoining on the south. On slopes facing west brush growths are covering the burned-over land with almost impenetrable thickets of chaparral. On eastern declivities leading into the South Fork of Rogue River Canyon are large tracts on which neither tree nor brush has as yet obtained a lodgment, nothing but a scant growth of weeds marking the site of the burned forest.

Classification of lands in T. 34 S., R. 4 E.

	Acres.
Forested area	15,340
Nonforested area (chiefly burned clean)	7,700
Badly burned area	8,000
Logged area	None.

Total stand of timber in T. 34 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	4.9	3,000,000	6,500,000
Red fir	13.1	8,000,000	13,000,000
White fir			2,800,000
Noble fir	32.8	20,000,000	25,000,000
Patton hemlock	32.8	20,000,000	40,000,000
Engelmann spruce	16.4	10,000,000	21,000,000
Total		61,000,000	108,300,000

Composition of forest in T. 34 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	3
Sugar pine	Scattered trees.
White pine	Scattered trees.
Lodge-pole pine	10
Red fir	4
White fir	2
Noble fir	20
Subalpine fir	1
Patton hemlock	40
Engelmann spruce	20

Township 34 South, Range 5 East.

The lines of this township include areas situated on both sides of the crest of the main range of the Cascades. The summit of the range strikes through the central sections almost in a straight north-south line. The crest of the range in this township consists of an old lava flow about three-fourths of a mile in width which appears to have come from a group of now extinct craters situated near the northern boundary. This lava stream shows marks of past glaciation; it is thinly covered with soil and in some places is extremely rough with loose blocks and bowlder accumulations. The western sections of the township consist of rough, rocky slopes descending into the canyon of the South Fork of Rogue River. A glaciated lava plateau abounding in low, intersecting morainic ridges of rough lava blocks comprises the southern portion of the eastern sections. Scattered over the surface of the plateau are scores of lakelets sunk in shallow depressions or held between ridges of glacial origin. Most of these lakelets have no visible outlet. The northern portion of the eastern areas of the township consists, in part, of the upper portion of Cherry Creek Canyon, a drainage channel largely owing its existence to glacial erosion, its bottom sunk a thousand feet below the level of the plateau through which it has been cut, and opening into the marshy areas of Upper Klamath Lake. The remainder of the township comprises rough lava fields and high ridges, which represent the remains of crater rims and interiors of a huge group of extinct volcanic vents. The group of craters here referred to, situated in the north-central portions of the township, forms one of the most interesting and remarkable of all the volcanic centers in this part of the Cascade Range. Originally it consisted of five craters grouped around a nucleus of very ancient lava which undoubtedly was ejected from still older craters. The diameters of the entire system were 3 miles north and south by 5 miles east and west, and the mountain around which the craters are grouped, now appearing as a narrow, jagged, sharp-crested ridge, rises to a height of about 7,200 feet above sea level. Most of the rims of the craters have long since been blown away by volcanic eruptions or cut out by glaciers which appear to have filled the craters to a depth of 1,000 or 1,500 feet. When these volcanoes were active they ejected vast streams of lava on all sides. Two of these streams, one south, the other northeast of the group, now constitute the crest of the Cascades in this locality.

The run-off from the township in part flows into Rogue River by way of its South Fork and in part empties into Upper Klamath Lake through Cherry Creek. Apparently, less of the precipitation sinks and more runs away as visible drainage than is the case in the township south, for both of the streams mentioned carry a large volume of water in their courses through the township. Most of the water in Cherry Creek is derived from two large creeks heading in the glaciated plateau area to which allusion has previously been made. These creeks probably are fed by

leakage from the many lakes which dot the plateau surface. Numerous lakelets and pools are found among the group of five craters. Some of them are situated in depressions in the ancient vents, others are perched high up in little niches or on narrow benches and terraces which have been excavated in the precipitous walls of the cliffs by glacial agencies. The upper portion of Cherry Creek Canyon discloses in great perfection evidences which prove the former existence of moving masses of ice in this valley. They consist of numerous narrow ledges of rock, having their long axis parallel with the direction of the canyon. In some localities these ridges of rock have been smoothly polished by the moving ice masses; in other places they are deeply scored by long, straight grooves from west to east, proving that the ice slid toward the basin now covered by Upper Klamath Lake.

There are no agricultural or grazing lands in the township.

The forest belongs to the Patton hemlock type. Fires have everywhere ravaged it. The upper portion of the Cherry Creek drainage basin and the areas adjacent to the base of the group of extinct volcanoes previously mentioned have been burned very near clean of their forest cover. Most of the standing timber is of small size, being chiefly reforestations after fires which denuded the region a decade or two anterior to the advent of the white man. A large proportion is lodgepole pine. Some consist of small, scraggy Patton hemlock and white pine.

The mill timber is of poor quality throughout. The soil is too thin to grow big timber, and the numerous fires which have devastated the region have badly damaged what they have not consumed. More than 75 per cent of the stands are composed of trees with basal diameters below 18 inches.

The region is generally inaccessible for logging operations. The only areas that can be reached are the Cherry Creek bottoms along the eastern edge of the township, but the tract does not carry enough timber to pay the cost of constructing roads to reach it.

At the present time no mineral-bearing areas are known in the township, but it is not unlikely that ground of this kind may be discovered in the region adjoining the group of ancient volcanoes. Lavas of the kind found in that locality have elsewhere been known to carry gold.

The areal and timber estimates for the township are as follows:

Classification of lands in T. 34 S., R. 5 E.

	Acres.
Forested area	19,140
Nonforested area (bare rocks 2,000, burned 1,900)	3,900
Badly burned area	8,500
Logged area	None.

Total stand of timber in T. 34 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Noble fir	41.6	5,000,000	10,000,000
Patton hemlock	50	6,000,000	17,000,000
Engelmann spruce	8.4	1,000,000	4,280,000
Total		12,000,000	31,280,000

Composition of forest in T. 34 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Lodgepole pine	70
Noble fir	10
Subalpine fir	3
Engelmann spruce, Yew, White pine	2
Patton hemlock	15

Township 34 South, Range 6 East.

The region comprised within the limits of this township is situated on the eastern slope of the Cascades. Most of it is a rocky, barren, desolate tract of country. The western and central portions of the township consist of broad, glaciated terraces of lava flanking the main crest of the Cascades. Along the eastern edge of this terraced region, where it breaks off to the slopes which lead down to the levels at the foot of the range, are ranges of broken, irregular combs and hills, perhaps the remains of ancient crater rims. The eastern sections comprise a narrow, level, bowlder-strewn terrace at the foot of the range and a strip of marshy meadow fringing Upper Klamath Lake.

The region is drained by Threemile and Cherry creeks; of the latter only the lower portion lies within the lines of this township. There are also a few insignificant rivulets and small springs. Cherry Creek carries a large volume of water during spring and early summer, but later diminishes very much in size; Threemile Creek is a stream of trifling proportions. The waters of both creeks are utilized for irrigation purposes in a small way by ranchers in the vicinity. It is self-evident that most of the rain water falling on the areas of this township sinks in crevices of the lava and is lost, for Cherry Creek, the largest stream in the township, gets most of its water from the next township west and south, and the outflow in other localities is trifling in amount.

There are a few hundred acres of land that by a stretch of imagination can be classed as agricultural. It is all contained in the narrow bowlder terrace at the foot

of the range. There are no grazing lands in the mountain areas. The lava ridges and terraces in those portions of the township are mostly too barren and rocky to sustain even a grass or sedge growth.

The forest consists of stands of red-fir and of yellow-pine types at low elevations, while at high altitudes and in the wet and swampy bottoms of Middle Cherry Creek the Patton hemlock type is the prevailing one. The yellow pine is of fair quality and is only moderately difficult of access. The greatest quantity and the largest dimensions occur at the mouth of Cherry Creek. Most of the really valuable mill timber in the township exists in the bottoms and on the slopes adjacent to that stream. In some places where the bottoms are swampy there are heavy stands of Engelmann spruce, averaging 90 to 110 feet in height, with diameters 3 to 4 feet, 2 feet from the ground, and clear trunks from 40 to 60 feet in length. Mixed with the spruce are numbers of veteran red firs of large size; some were seen with diameters of 7 feet. In the western portions of the township most of the forest is of small dimensions and is chiefly composed of lodgepole pine, Patton hemlock, and noble fir.

Fire has marked the forest in all portions of the township. The damage due to this cause has been especially severe and extensive in the western areas, where most of the destruction has been done since the white man's occupancy of the country. In late years big fires in Cherry Creek Canyon have destroyed 30 per cent of the only really valuable mill timber in the township. About midway up that canyon are large salt or alkali licks that have from time immemorial been the gathering place for all the deer in the surrounding country. A good many hunting parties also come here to slay the deer at the licks; fires are the inevitable result.

Reforestations of the burned-over areas are few and thin. Most of the young forest outside the yellow-pine areas consists of lodgepole pine. Where the yellow-pine stands have been destroyed heavy brush growths of the vellum-leaved ceanothus have followed. On a few of the higher elevations facing east and south the forest has been replaced with a thin sward of grass. In the burns which have occurred in the Patton-hemlock type large tracts are entirely bare of vegetation.

No mineral-bearing areas are known in the township.

Classification of lands in T. 34 S., R. 6 E.

	Acres.
Forested area	13,440
Nonforested area (marsh and rocks, 6,000; burned, 3,600)	9,600
Badly burned area	4,000
Logged area	None.

Total stand of timber in T. 34 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	20	10,000,000	20,000,000
White pine	2	1,000,000	1,540,000
Red fir	10	5,000,000	8,500,000
White fir	16	8,000,000	38,000,000
Noble fir	34	17,000,000	25,000,000
Patton hemlock	6	3,000,000	9,000,000
Engelmann spruce	12	6,000,000	8,000,000
Total		50,000,000	110,040,000

Composition of forest in T. 34 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
White pine Lodgepole pine	2
Red fir	8
Noble fir	25
White fir	30
Patton hemlock	10
Engelmann spruce	5

Township 35 South, Range 4 East.

This township lies well over on the western slopes of the main range of the Cascades, owing to a curve in the crest line toward the east after leaving Mount Pitt.

The western portion of the township consists of a series of low, narrow terraces parallel to the crest of the range, each terrace appearing to mark the outer rim of successive lava flows. The central and eastern areas comprise bowlder-strewn slopes rising with an easy gradient toward the crest.

The drainage from the township is small in amount and is mostly contained in Clark Fork and Fourmile Creek, which head in the township. Eventually it finds its way into Rogue River through Big Butte Creek. The waters of the streams flowing from the township are used locally, in a small way, for irrigation purposes.

The township has been heavily forested. All the heavy stands have been burned in recent times; that is to say, since the advent of the white man. The southern boundary of the township marks the beginning of the immense burns, which stretch northward along the summit and the immediate western declivities

of the main range for a distance of at least 40 miles. Throughout the central and western areas of the township and almost through the next one north, a distance of about 11 miles with a width of 5 miles, there is one solid burn, where scarcely a tree is to be seen outside of the swampy or wet slopes of a few of the larger canyons. It is the most thorough and complete sweep of a standing forest by fire that I have ever seen. The burned areas have become covered with brush composed of huckleberry, manzanita, garrya, service berry, and vellum-leaved ceanothus, the latter being the most abundant and conspicuous species.

No reforestations are visible, as yet, on these tracts. The western areas have suffered comparatively little from fire.

The forest is mostly of the yellow-pine type, small stands of red-fir type occur here and there, and thin lines of Patton-hemlock type follow the upper courses of some of the canyons which supply Clark Fork and Four Bit Creek. The stands of yellow-pine type are of considerable value and easy of access. They are found in the western portion of the township on the different terraces. The trees are remarkably thick set. Sometimes there are 80 trees per acre of logging size, a large number for stands of the yellow-pine type. Another remarkable feature of these stands is the short, clear trunk and low stature of most of the trees. The greater number will not average much over 18 feet in clear trunk and 20 inches in diameter. These yellow-pine stands are much mixed with California black oak and Pacific post oak. I know of no place in this region where the oaks approach the crest line of the Cascades so closely in their range as in this township. In a straight line their farthest easterly station is not more than 8 miles from the summit.

All of the commercially valuable timber can easily be logged from the west via the Rancheria-Fort Klamath wagon road.

No mineral-bearing areas are known to occur in the township.

There is neither agricultural nor grazing land in the township. The forest floor in the yellow-pine stands is covered with a thin growth of grass, which is occasionally visited by bands of stock. Its value is unimportant.

Classification of lands in T. 35 S., R. 4 E.

	Acres.
Forested area	12,240
Nonforested area (chiefly burned)	10,800
Badly burned area	12,000
Logged area	None.

Total stand of timber in T. 35 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	57.8	52,000,000	69,000,000
Red fir	27.7	25,000,000	42,000,000
White fir			2,750,000
Noble fir	11.1	10,000,000	15,000,000
Patton hemlock	3.3	3,000,000	6,000,000
Total		90,000,000	134,750,000

Composition of forest in T. 35 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	48
Sugar pine	Scattered trees.
White pine	Scattered trees.
Lodgepole pine	Scattered trees.
Red fir	30
White fir	1
Noble fir	14.5
Patton hemlock	5
Oak	1.5

Township 35 South, Range 5 East.

This township is situated in part on the western slopes and in part on the eastern declivities of the Cascades, the crest line of the range passing through it from north to south a little west of the center. The summit of the range consists of a plateau-like area having a mean elevation of 6,000 feet. A narrow, low ridge of lava along the western edge of the plateau forms the crest. A low ridge of lava stretches across from east to west, connecting the extinct volcanic cone, Lost Peak, with the volcanic areas along the crest. The plateau extends eastward and covers all of the eastern sections of the township. It has been extensively glaciated, and as a result low ridges consisting of blocks of lava are heaped up and surround shallow depressions which hold small lakelets, most of which have no visible outlet.

The western portion of the township consists of areas sloping into the canyon of South Fork of Rogue River, which heads near the southern line of the township. Near its head the stream lies mostly in a narrow, rocky valley, immense crags and cliffs forming the western wall of its canyon. The eastern side slopes back more gradually.

The headwaters of South Fork of Rogue River drain the western part of the township. The stream heads in a number of lakes, the largest of which is 1½ miles

in length and 350 or 400 yards in width. These lakes are situated in the bottom of the canyon and are known as Blue Canyon Lakes. Within the township the South Fork of Rogue River is a small rivulet; its canyon, while narrow, is entirely out of proportion to the small volume of water now flowing through it. As with many other streams in the region, the amount of water in its upper portions does not anywhere near account for the quantities which must be shed from the adjacent slopes. The southern areas of the eastern sections of the township drain into tributaries of Fourmile Creek, which empties into Pelican Bay. The northern portions have no definite visible drainage. The precipitation either sinks directly into fissures in the lava or accumulates in small lakelets which may possess underground outlets.

The township contains no agricultural lands. Marshy places around the edges of Blue Canyon Lakes and the lakelets in the eastern areas of the township would supply small quantities of pasturage, but the tracts are all difficult of access.

The forest is of the Patton-hemlock type throughout. Fires of modern origin have ravaged it extensively. The great burns which cover the eastern areas of the adjoining township on the west extended into the western portion of this township and wrought great havoc among what must once have been heavy stands of noble fir. The forest in the eastern areas has suffered no less, and there are scant signs of reforestation. Most of the young growth now standing is overwhelmingly composed of lodgepole pine. The bottom and eastern slopes of the South Fork Canyon have escaped fairly well, and carry a forest in a state of tolerably good preservation. Much of it has not experienced a fire for 300 or 400 years, and in consequence it contains a vast amount of litter, consisting chiefly of the original lodgepole-pine growth which followed a fire that occurred between three and four centuries ago. The lodgepole pine has had time to mature, die, and fall down, and a new forest 150 years old has taken its place since that time. The soil having had time to regain its normal moisture ratio, the last forest on this tract is not lodgepole pine, but is composed of Engelmann spruce, Patton hemlock, noble fir, and subalpine fir.

The mill timber throughout the township is of poor quality, besides being composed of undesirable species from a lumberman's point of view. With the exception of the southern portion of the eastern areas, the timbered tracts in the township are practically inaccessible so far as logging operations are in question, or, in other words, 90 per cent of the forested area can not be logged.

No mineral-bearing ground has been discovered in the township.

Classification of lands in T. 35 S., R. 5 E.

	Acres.
Forested area	16,640
Nonforested area (chiefly burns)	6,400
Badly burned area	8,000
Logged area	None.

Total stand of timber in T. 35 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Noble fir	29.2	7,000,000	14,000,000
White fir	.....	.....	6,450,000
Patton hemlock	25	6,000,000	15,000,000
Engelmann spruce	45.8	11,000,000	17,000,000
Total	.....	24,000,000	52,450,000

Composition of forest in T. 35 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
White pine	Scattered trees.
Lodge-pole pine	10
White fir	2
Noble fir	30
Patton hemlock	30
Engelmann spruce	28

Township 35 South, Range 6 East.

This township is situated wholly on the eastern side of the main range of the Cascades and consists in part of the northern, eastern, and southern slopes of Lost Peak, an extinct volcanic cone situated in the western edge of the township and rising to a height of 8,000 feet above sea level, and in part in the eastern sections of marshy and swamp lands on the margins of Upper Klamath Lake. The mountainous portions of the township are uniformly rocky and barren at all of the higher elevations and throughout, at all altitudes, on the northern and western slopes of Lost Peak.

The visible water supply is in a few small springs and insignificant rivulets. The large precipitation which must fall on a mountain of the size and elevation of Lost Peak sinks in the crevices of its lava and is lost to view.

There are no agricultural lands in the township. The marshy areas in the eastern sections produce heavy growths of sedge and tule, but the lands are too wet and mucky to permit of their use for pasture or hay.

The forest consists of the three chief types common to the slopes of the Cascades in this region. The red-fir and the yellow-pine types are not closely differentiated, the red and white fir components in the first-mentioned type forming more nearly subtype aggregations in the stands of yellow-pine type. The mill timber at the lowest and middle elevations on the southern and eastern slopes of Lost Peak is of fair quality and moderately easy of access, but is generally of small dimensions. Elsewhere and at high altitudes it is of poor quality and inaccessible.

Fires have marked nearly all of the forests throughout the township. Most of

the damage has been on the northern and western slopes of Lost Peak. Reforestation is scanty, most of it being composed of scattered stands of lodge-pole pine. Many of the burned-over tracts are covered with dense brush growth of various species of shrubs, the vellum-leaved ceanothus being the most common and prominent species.

None of the lands are mineral in character.

The areal and timber estimates are as follows:

Classification of lands in T. 35 S., R. 6 E.

	Acres.
Forested area	16,740
Nonforested area (bare rocks and marsh 5,500; burned, 800)	6,300
Badly burned area	5,200
Logged area	None.

Total stand of timber in T. 35 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	44.2	25,000,000	38,000,000
Sugar pine	3.5	2,000,000	2,650,000
White pine	.9	500,000	500,000
Red fir	17.7	10,000,000	20,000,000
White fir	8.9	5,000,000	30,000,000
Noble fir	17.7	10,000,000	15,000,000
Patton hemlock	7	4,000,000	6,000,000
Engelmann spruce			500,000
Total		56,500,000	112,650,000

Composition of forest in T. 35 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	20
Sugar pine	.8
White pine	.1
White-bark pine	.01
Red fir	30
White fir	26
Noble fir	14
Patton hemlock	7.3
Engelmann spruce	1

Township 36 South, Range 4 East.

This township in part is situated on the western slope of the Cascades. In part it covers the summit, while the extreme eastern sections lie on the eastern declivities of the range. The crest line of the Cascades enters the township near the northeast corner, forming a west-curving arch toward the southeast corner, where it leaves the township.

The western areas of the township consist of a series of narrow, flat [illegible]

encircling the base of Mount Pitt. The central and eastern sections contain Mount Pitt in the northern portions and have the southern and intermediate areas filled with vast lava flows from the volcanic vents which anciently existed around this peak.

Mount Pitt, seen from any direction, appears as a huge, symmetrical, sharp-pointed cone. In reality it is a narrow hogback which originally formed the western and southern segments of the periphery of a huge crater. Most of this crater has been blown away by ancient eruptions, leaving standing the sharp-crested ridge now known as Mount Pitt. At the northwestern termination the ridge falls sharply and precipitously away, which, together with the steep slopes on all sides, give it the characteristic conical aspect. The mountain has an altitude of 9,760 feet. It stands on a nearly circular platform of lava about 6 miles in diameter. A great deal of this lava is of the most vesicular type and is indescribably rough. It has issued from fissures at the base of the mountain and is of comparatively recent formation, much of it not having the slightest soil covering, or supporting any vegetation except mosses and lichens in the crevices.

The crest line of the Cascades passes directly through the mountain and continues southward to Mount Brown, being formed, in part, between the two peaks of a rough lava flow which apparently welled out from a fissure that opened southward from Mount Pitt, and, in part, from lava flows ejected northward from Mount Brown.

With the exception of a few unimportant rivulets, the entire visible drainage of the township is concentrated in the North Fork of Little Butte Creek. This stream and its water supply is of some importance, inasmuch as it is drawn upon for a large portion of the irrigation water utilized on the semiarid tracts in the region of Eagle Point and Brownsboro in the Rogue River Valley. The stream first issues from under a mass of rough, heaped-up lava which forms the crest of the Cascades between Mounts Pitt and Brown. It does not come forth as small springs, but flows out in a sheet 40 or 50 feet wide and 3 to 4 feet in depth, with a strong, steady current of ice-cold water. Immediately after issuing from under the lava it enters a sort of reservoir named Fish Lake, which in reality is only a widening of the stream. The lake is about a mile in length, one-third of a mile in width, and 4 to 5 feet in depth. The creek leaves the lake at the west end through a gap one-fourth of a mile in width, which soon narrows to 150 yards. It is cut through a mass of lava and is 50 to 60 feet in depth. Fish Lake is excellently situated for water-storage purposes.

There are no agricultural lands in the township. On the south side and at the west end Fish Lake is bordered by 200 to 250 acres of marshy meadow land, partly dry during a portion of each year, overflowed at high water, and covered with a coarse growth of tough and wiry sedge.

Cattle range through the forest, and both cattle and horses are occasionally driven to the marshy ground around the lake for summer pasture. In past years sheep were pastured at the lake, but none have been there in recent years.

All of the forest types occurring on the western slopes of the Cascades in the Rogue River Basin are represented in the township, but of the yellow-pine type there is but a small quantity. Most of the township is covered with stands of the red-fir type. The Patton-hemlock type occurs on the slopes of Mount Pitt and on the adjacent high-altitude areas. The summit of Mount Pitt projects about 350 feet above the timber line on the southern declivities and 800 feet above the line on the northern slopes.

Forest fires have ravaged all of the timbered tracts, consuming an enormous quantity of mill timber, if one may judge from the density of a few of the surviving veteran stands on the northern side of Fish Lake, which in some localities will cut 90,000 feet B. M. per acre. Especially have the fires been severe in the timbered tracts below the Mount Pitt platform to the west of the mountain. In almost every case the burned-over areas have grown up to brush, with scant signs of reforestation. In the burns a mile or two north of Fish Lake fires of recent origin have burned out even the soil down to the rough lava foundation. This has been possible because the soil on the younger lava flows, when there is any at all, is wholly composed of decaying woody matter.

The timber is of fair quality in the southwestern and west-central areas, but elsewhere is much damaged by rot due to fire sears and scars. It can be logged on all areas below subalpine elevations by way of the old Rancheria-Fort Klamath wagon road, which runs through the center of the next township north, and, over a road with easy gradients, which affords an outlet to the Rogue River Valley settlements.

Classification of lands in T. 36 S., R. 4 E.

	Acres.
Forested area	16,040
Nonforested area (naturally nonforested, 4,500; burned, 2,500)	7,000
Logged area	None.

Total stand of timber in T. 36 S., R. 4. E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	3.1	5,000,000	10,000,000
Sugar pine	1.3	2,000,000	2,000,000
White pine	3.7	6,000,000	8,500,000
Red fir	75	120,000,000	148,000,000
Noble fir	11.9	19,000,000	37,000,000
White fir	5	8,000,000	27,000,000
Patton hemlock	.....	.....	13,000,000
Mertens hemlock	.....	.....	1,500,000
Engelmann spruce	.....	.....	1,000,000
Total	.....	160,000,000	248,000,000

Composition of forest in T. 36 S., R. 4 E., including trees of all species with diameters of 4 inches at the base and upward.

	Per cent.
Yellow pine	5
Sugar pine	.25
White pine	2
White-bark pine	.001
Lodgepole pine	1
Red fir	60
White fir	14
Noble fir	10
Subalpine fir	.001
Patton hemlock	7
Mertens hemlock	.7
Engelmann spruce	.3

Township 36 South, Range 5 East.

This township is situated wholly on the eastern slope of the Cascades. The western areas consist of high, rough lava flows ejected partly from Mount Pitt, partly from Mount Brown; the central portions consist of glaciated lava flows, with numerous depressions holding small lakes and marshes, while the eastern sections are flat and marshy, with intersecting low combs and ridges of volcanic rock.

The drainage of the township flows into Pelican Bay of Upper Klamath Lake through a number of small creeks heading near Mount Pitt, and mostly dry in the summer time. In the north-central regions of the township is Fourmile Lake, 2½ miles in length by one-half or three-fourths mile in width. East and south of the lake there are a dozen or more shallow lakelets scattered about in the depressions existing in the lava sheet along the northeast foot of Mount Pitt. The paucity of visible drainage from this and the foregoing townships, and in general from the entire region of high and middle altitude in the Cascades south of township 34, is noteworthy. Evidently most of the water sinks in the lava, which must be widely fissured. It is not clear where it again comes to the surface. Possibly the large and numerous springs rising in the bottom of Pelican Bay in Upper Klamath Lake account for some, but most of it is lost, or at least does not come to the surface anywhere in the immediate region of the Cascades.

There are no agricultural lands in the township. Nearly all of the creeks in the central and eastern portions are boardered by marshy sedge meadows which could be utilized for pasturage.

The forest is chiefly of the red-fir type. Areas near Mount Pitt carry stands of Patton-hemlock type and tracts in the eastern sections contain small quantities of yellow-pine type.

Forest fires have ravaged the township everywhere. Recurrent fires in the central and eastern areas have laid waste large tracts of lodgepole-pine reforestations after earlier fires. In the western portions heavy stands of veteran noble fir have

been destroyed, leaving behind only lone trees here and there. The reforestations have been confined mostly to low-lying areas with plenty of seepage and soil moisture. On the slopes, brush growths have replaced the forest in almost every instance. Altogether 40 per cent of the standing timber has been destroyed by fire within the last forty or forty-five years, and at least 50 per cent of the ensuing reforestations of lodgepole pine. The old military road between Fort Klamath and the Rogue River Valley passed through the center of the township in an east–west direction. The travel over this road was, doubtless, responsible for many of the devastating fires which have demolished its forests.

The quality of the timber is poor, owing to the frequent fires. The white pine occurs chiefly in the south-central portions of the township. It is of small growth, seldom exceeding 20 inches basal diameter and 30 feet clear trunk. The township can be logged from the Pelican Bay region, but none of its areas are readily accessible.

No mineral deposits are known to occur in the township.

Classification of lands in T. 35 S., R. 5 E.

	Acres.
Forested area	12,840
Nonforested area (meadows, etc., 5,000; burned clean, 5,200)	10,200
Badly burned area	12,000
Logged area	None.

Total stand of timber in T. 36 S., R. 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	5.3	3,000,000	3,000,000
White pine	14	8,000,000	12,000,000
Red fir	35	20,000,000	36,000,000
White fir	17.6	10,000,000	60,700,000
Noble fir	17.6	10,000,000	13,000,000
Patton hemlock	8.8	5,000,000	10,000,000
Mertens hemlock			2,000,000
Engelmann spruce	1.7	1,000,000	3,000,000
Total		57,000,000	139,700,000

Composition of forest in T. 36 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	2
White pine	8
Lodgepole pine	8
Red fir	20
White fir	45
Noble fir	10
Patton hemlock	5
Mertens hemlock	1
Engelmann spruce	1

Township 36 South, Range 6 East.

This township is situated wholly east of the Cascades, and comprises in the western and southern areas low rocky terminations of the volcanic mountain masses of the adjacent townships on the south and west. The central portions consist of low marshy flats, extending eastward and connecting with marshy tracts bordering Pelican Bay, which, together with a small portion of the bay, cover the eastern sections of the township.

Almost the entire visible water supply flows into Fourmile Creek, through which it finds its way into Pelican Bay. Exception should be made in the case of the large and numerous springs which rise in the bottom of that bay, and whose origin undoubtedly is in the mountains in the western portion of the township. The volume of water in Fourmile Creek is small until about 2 miles above its outlet, where it is suddenly augmented.

The lands which can be utilized for purposes of agriculture comprise 2,000 acres; the grazing lands about 2,000 more. The tracts of grazing and agricultural lands are situated along Fourmile Creek, in the central areas of the township, extending westward about 3 miles from the marshy areas bordering Pelican Bay, and in the southeastern sections of the township bordering the bay. With few exceptions they are wet and liable to overflow, but are capable of yielding large quantities of coarse wild hay. The marshy areas bordering Pelican Bay are very wet and muddy, and can be pastured only in late summer and fall. Almost all of the grazing and agricultural land is held by residents or nonresident private owners. Some of the land here classed as agricultural is covered with half-burned growths of lodgepole pine, requiring clearing. The grazing lands are naturally nonforested, and must so remain, owing to their wet and swampy nature. Lying directly in the track of the draftage from the permanently snow-covered northeastern slopes of Pitt, the region is frosty, or at least liable to summer frosts. It is doubtless for this reason that no agricultural improvements of much value or permanency have been made.

The forest is wholly of yellow-pine type. Fires have ravaged it in all directions, and have been followed by lodgepole-pine reforestations on low-lying areas, and by brush growths on the higher and drier. The best timber is found on the southern slopes of Lost Peak, in the north-central areas of the township, along the bottoms of Fourmile Creek, on tracts elevated sufficiently to be permanently above high water, where occur heavy and very valuable stands of nearly pure growth yellow pine, and in the southeastern sections of the township, where the forest is thickest, but the timber of inferior quality.

The township can easily be logged from Pelican Bay. The logging so far done consists of cuttings to supply local demands of settlers, and has been carried on for

many years. The cutting in the extreme southeast corner of the township has been for export to the mills at the foot of Upper Klamath Lake.

No mineral-bearing areas have been discovered in the township.

Classification of lands in T. 36 S., R. 6 E.

	Acres.
Forested area	15,840
Nonforested area (meadows, marsh, etc.)	7,200
Badly burned area	5,500
Logged area (98 per cent then burned over)	2,000

Total stand of timber in T. 36 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	73.7	95,000,000	110,000,000
Sugar pine	6.2	8,000,000	8,300,000
Red fir	19.3	25,000,000	35,000,000
White fir	.....	.....	20,000,000
Incense cedar	.8	1,000,000	2,100,000
Total	.....	129,000,000	175,400,000

Composition of forest in T. 36 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	40
Sugar pine	1
Lodgepole pine	20
Red fir	20
White fir	18
Incense cedar	1

Township 37 South, Range 4 East.

This township forms the southwest corner of the reserve and is situated wholly on the western declivities of the Cascades. It consists of rough and rocky areas, the eastern sections covered with lava flows from an extinct cone in the township to the east, locally known as Mount Brown. Most of these lava flows are of comparatively recent origin, so much so that no soil has as yet covered them.

The forest is of red-fir type, light and irregular in the eastern half of the township, but comprising some exceedingly heavy stands in the western areas.

The township contains no agricultural lands, but along North Fork of Little Butte Creek, which drains the western half of the township, are narrow swales of grazing lands, marshy or merely wet during stages of low water, submerged during flood seasons. Cattle range throughout the township, and considerable tracts of forest

have been burned within recent years, apparently to provide browse for the stock. There are no signs to indicate that sheep have been pastured in the township in recent years.

In the aggregate there are only 1,000 or 1,500 acres in the township not touched by fires of modern origin. These tracts exist as small, detached spots, everywhere surrounded by a network of fire lanes, where the destruction varies from 10 per cent to total.

The density of the forest varies much. On the lava flows from Mount Brown it is less than 2,000 feet B. M. per acre. In the western sections of the township the best stands average 17,000 feet B. M. per acre, while small areas here and there in the same section run as high as 80,000 feet B. M. per acre.

With the exception of the lava tracts in the eastern portions of the township, which are wholly inaccessible, the timbered areas can be logged from the south by way of the Ashland-Pelican Bay wagon road.

No mineral deposits are known to exist in the township.

Classification of lands in T. 37 S., R. 4 E.

	Acres.
Forested area	18,940
Nonforested area (bare rocks, meadows, glades, etc., 3,100; burned clean, 1,000)	4,100
Badly burned area	4,500
Logged area	None.

Total stand of timber in T. 37 S., R. 4 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
White pine	8.2	13,000,000	18,000,000
Red fir	69.2	110,000,000	180,000,000
White fir	12.5	20,000,000	48,500,000
Noble fir	9.4	15,000,000	26,000,000
Engelmann spruce	.6	1,000,000	3,500,000
Yellow pine			940,000
Total		159,000,000	276,940,000

Composition of forest in T. 37 S., R. 4 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	0.2
White pine	6
Sugar pine	Scattered trees.
Lodgepole pine	.8
Red fir	64
White fir	18
Noble fir	10
Engelmann spruce	.8

Township 37 South, Range 5 East.

The western portion of this township consists of the crest-line areas of the main range of the Cascades; the central of a depression stretching from north to south with a width of 2 to 3 miles, and the eastern of the western slopes of a high, rugged, volcanic mountain mass lying between the Cascades and Upper Klamath Lake.

In the northwest corner of the township the crest of the Cascades is formed of an extinct volcanic cone locally known as Mount Brown. Lines of comparatively recent lava flows ejected from this vent constitute the crest for some miles south from this cone. Near the southwest corner of the township the lava flows come to an end and the summit of the range is a flat or gently rolling area 2 to 2½ miles in width.

Most of the central depression in the township is covered with the waters of Lake of the Woods. This is a shallow sheet of water, 3 miles long, about a mile in width at its widest portion. Its western shore line, formed by lava flows from Mount Brown, rises rocky and abrupt; its eastern shores are marshy for a short distance back from the lake, then rise gently toward the east in a succession of terraces.

Considering that the township lies within a region of comparatively heavy precipitation, its visible run-off is remarkably small. Evidently most of the water sinks in the much-fissured lava to reappear somewhere outside the township boundaries. The Lake of the Woods, which forms a sort of reservoir for the entire visible drainage of the township, empties into Upper Klamath Lake through an insignificant creek, which is dry throughout most of the year. It is not unlikely that the lake has an underground outlet.

The township contains no agricultural lands. The northern and the southern ends of Lake of the Woods terminate in marshes containing in the aggregate about 1,200 acres. They produce heavy growths of coarse marsh sedges and species of rush, and are covered with water to a depth of 2 to 4 feet during portions of the year.

The forest is chiefly of the red-fir type. It contains a small percentage of yellow pine, which species here crosses the Cascades, one line coming north from the yellow-pine areas in the Klamath Gap, another coming from the southwest through low gaps in the crest line of the range from the headwaters of Jenny and Dead Indian creeks. The red and white firs also cross the range in this township.

Fires have ravaged the entire township. With the exception of the thinly forested lava flows on the slopes of Mount Brown, I did not see a patch of forest as large as 20 acres which did not show the marks of fire within the past forty years. In many localities the fires have made a clean sweep of the timber, and the areas have grown up to brush; in other places they have been of low intensity, burning 40 per cent of a stand here, 5 per cent there, or merely destroying individual trees, but

consuming the humus and killing the undergrowth. The areas to the west and at the south end of Lake of the Woods have been exceptionally badly damaged by recent fires. The entire township seems to have been peculiarly exposed to destructive forest fires for ages. Most of its forest consists of reforestations less than 120 years of age, which in some places contain scattered trees of veteran red fir 400 or more years old. One of the noteworthy features of the reforestations is the very large quantity of white fir in their composition.

Most of the timber in the township can be logged from the eastern side of the range via the Ashland-Pelican Bay wagon road. The areas around Mount Brown are inaccessible, so far as logging operations are in question. The timber is generally of inferior quality throughout, having been too often exposed to forest fires.

No mineral deposits are known to occur in the township.

Classification of lands in T. 37 S., R. 5 E.

	Acres.
Forested area	16,640
Nonforested area (lakes and marshes, 4,000; burned clean, 2,400)	6,400
Badly burned area	7,000
Logged area	None.

Total stand of timber in T. 37 S., R 5 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	3.9	2,000,000	2,000,000
White pine	11.6	6,000,000	12,000,000
Red fir	39	20,000,000	30,000,000
White fir	19.4	10,000,000	120,000,000
Noble fir	23.2	12,000,000	16,000,000
Patton hemlock	2.9	1,500,000	3,000,000
Mertens hemlock			2,500,000
Engelmann spruce			400,000
Total		51,500,000	185,900,000

Composition of forest in T. 37 S., R. 5 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	1
White pine	5
Lodgepole pine	3
Red fir	15
Noble fir	8
White fir	64
Engelmann spruce	Scattered trees.
Patton hemlock	2
Mertens hemlock	2

Township 37 South, Range 6 East.

This township constitutes the southwest corner of the reserve and is situated east of the main range of the Cascades. Almost the entire township is filled with the mass of a high, craggy mountain range of volcanic origin, connecting with the Cascades through a level plateau area in the northern portion of T. 38 S., R. 5 E.

The township has no agricultural or grazing lands. There are small grassy glades scattered throughout the mountain areas, but they are practically inaccessible.

The forest is a mixture of yellow-pine, red-fir, and Patton-hemlock types. On the eastern and northern slopes there are small tracts at the lowest elevations carrying stands of forest in which yellow pine predominates. At higher elevations occurs the red-fir type, while the great body of the mountain mass bears only stands of Patton-hemlock type of low, scraggy growth scattered among rocky peaks and canyons or on lava slopes where large, bare areas separate the thin lines and groups of trees.

Fires have run throughout the entire township, consuming 25 per cent of the timber and badly damaging the remainder. Brush growths composed chiefly of the vellum-leaved ceanothus (*Ceanothus velutinus*) have covered the burned areas in place of reforestations. The southeastern sections especially have suffered severely.

Most of the drainage of the township sinks through the fissured lava rocks and is lost. The superficial flow is small and inconsequential.

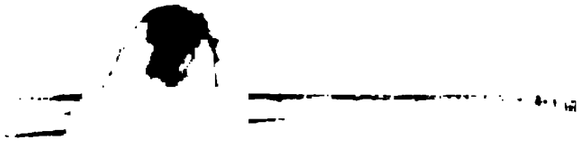
Small portions of the northern and eastern areas can be logged from the levels bordering Upper Klamath Lake, but the forest in the larger portion of the township can not be reached.

Classification of lands in T. 37 S., R. 6 E.

	Acres.
Forested area	14,040
Nonforested area (bare rocks, etc., 5,000; burned clean, 4,000)	9,000
Badly burned area	6,000
Logged area	None.

Total stand of timber in T. 37 S., R. 6 E.

Species.	Local practice.		Michigan practice.
	Per cent.	*Feet B. M.*	*Feet B. M.*
Yellow pine	12.6	7,000,000	11,000,000
Sugar pine	1.8	1,000,000	1,000,000
White pine	.9	500,000	800,000
Red fir	7.2	4,000,000	4,000,000
White fir	18	10,000,000	40,000,000
Noble fir	39.9	22,000,000	33,000,000
Patton hemlock	14.4	8,000,000	15,000,000
Engelmann spruce	5.4	3,000,000	6,000,000
Total		55,500,000	110,800,000



Composition of forest in T. 37 S., R. 6 E., including trees of all species with basal diameters of 4 inches and upward.

	Per cent.
Yellow pine	10
Sugar pine	.6
White pine	.9
Lodgepole pine	22
Red fir	3
White fir	20
Noble fir	18
Patton hemlock	20
Engelmann spruce	5

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